Myitgne River Basin CIA Study

INCEPTION WORKSHOP
MISSION 2: 13-14 FEBRUARY 2019
NAY PYI DAW, MYANMAR

IFC International Finance Corporation
WORLD BANK GROUP

Creating Markets, Creating Opportunities

MOEE

MONREC

SWECO

IN PARTNERSHIP WITH:

Australian Aid

UKaid

OPENING REMARKS

REVIEW OF AGENDA AND INTRODUCTION TO SPEAKERS

Workshop Objectives

- To introduce the Myitnge CIA study to stakeholders, and the proposed implementation plan.
- To build capacity of stakeholders on the purpose, process and global experience of CIAs.
- To share the initial findings of the study team on Myitnge River basin information relevant to this study, and to obtain feedback and additional insights on this information.
- To discuss key scoping matters for the CIA, including spatial and temporal boundaries, the Base Case Power Development scenario, and Valued Environmental and Social Components (VECs).
- To work in small groups to discuss and evaluate potential VECs.

Workshop Agenda – Day 1

- 09:00 Opening remarks
- 09:30 Context and Vision for the Myitnge CIA
- 09:45 Implementation Plan for the Myitnge CIA
- 10:15 ***Questions and Discussion:*** Purpose and approach of the Myitnge CIA
- ***10:30 BREAK***
- 11:00 ***Capacity-Building:*** Introduction to and Experiences with CIA
  - Role of CIA, steps from IFC Good Practice guide,
  - Global experience, lessons learned
  - The Kuri-Gongri Basin CIA in Bhutan
  - The Cumulative Impact Assessment Matrix (CIAM)
- 12:15 ***Questions and Discussion:*** About CIAs
- ***12:30 LUNCH***
- 13:30 ***Myitnge River Basin*** - State of knowledge, available information, local views
- 14:45 ***Questions and Discussion:*** Myitnge Basin issues and knowledge gaps
- ***15:15 BREAK***
- 15:45 ***Capacity-Building:*** CIA Scoping
- 16:00 Establishing spatial boundaries – options, discussion
- 16:15 Establishing temporal boundaries – options, discussion
- 16:30 Establishing the Base Case Power Development Scenario - options, discussion
- ***17:00 DAY 1 CLOSE***

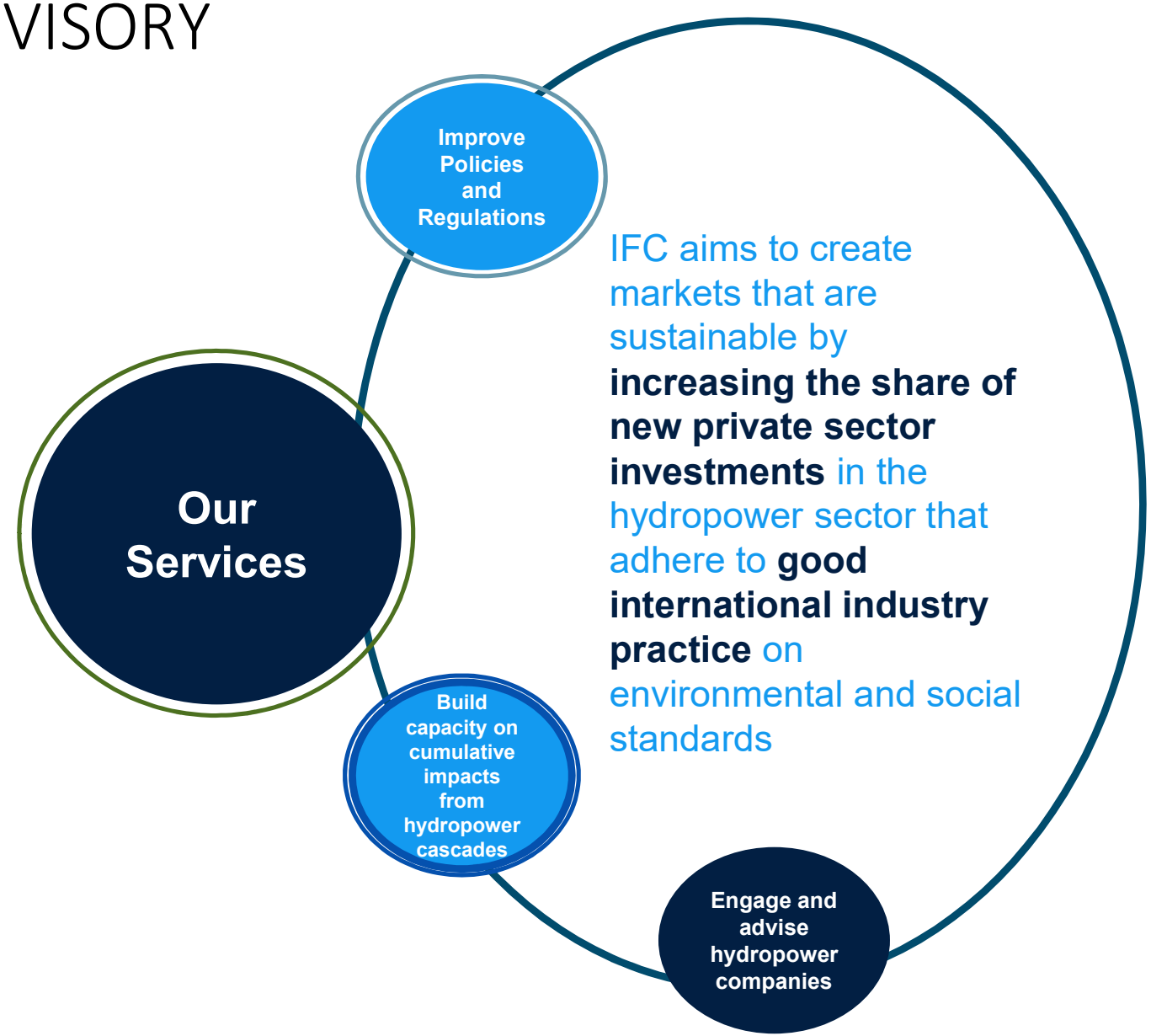
Workshop Agenda – Day 2

- 09:00 Opening remarks
- 09:10 Review of previous day and objectives for Day 2
- 09:20 ***Questions and Discussion:*** Areas of concern regarding potential cumulative impacts in Myitnge Basin
- 09:45 ***Capacity-Building:*** Valued Environmental and Social Components (VECs)
  - Role
  - Selection criteria
  - Selection process
- 10:05 Candidate VECs for the Myitnge Basin
- 10:25 Explanation of small group work
- ***10:30 BREAK***
- 11:00 ***Small group work:*** Analysis of candidate VECs
- ***12:30 LUNCH***
- 13:30 Report back from small groups
- 14:15 ***Questions and Discussion:*** Myitnge Basin CIA potential VECs
- 14:45 Review of CIA scoping options and key messages from workshop discussions
- 15:10 Closing remarks
- ***15:30 REFRESHMENTS AND CLOSE OF WORKSHOP***

CONTEXT AND VISION FOR THE MYITNGE CIA

HYDRO ENVIRONMENTAL AND SOCIAL ADVISORY

Creating and strengthening markets that are environmentally and socially sustainable requires firms, investors and financial institutions to integrate strong ESG practices in their strategies and operations.



IFC aims to create markets that are sustainable by **increasing the share of new private sector investments** in the hydropower sector that adhere to **good international industry practice** on environmental and social standards

Myanmar's SEA

Informed process:
- better informed and improved dialogue between stakeholders
- greater understanding by decision makers/others on range of stakeholder values and priorities for the sustainable hydropower

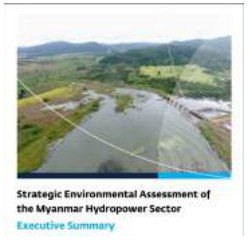
Open and broad consultation:
- 55 multi-stakeholder activities + an Advisory Group + 6 Expert Groups
- Government technical focal points on SEA team
- River basin consultations, workshops, deep dives
- Case Studies on existing HPPs and views of dam-affected people

Technical studies:
- Baseline assessments - hydrology & geomorphology, aquatic ecology/fish, terrestrial ecology, social/livelihoods, conflict, hydropower and energy, economics
- Hydropower database
- Mainstem and sub-basin evaluations
- BAU development impact (sustainability) analysis

Sustainable Development Framework '1st edition'
- Mainstem Reservation, Sub-basin zoning + Implementation plan

OBJECTIVES

- Maintain natural river basin processes & functions that regulate and maintain river health and other ecosystem services;
- Retain unique & important biophysical and cultural sites and values;
- Avoid unacceptable social, livelihood and economic impacts;
- Recognize, understand and avoid or manage conflict risks;
- Provide development benefits to project affected people, communities and regions; and
- Generate adequate, reliable and affordable hydropower energy for domestic consumption.



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မဟာဗျူဟာမြောက် ပတ်ဝန်းကျင်ဆိုင်ရာဆန်းစစ်မှု
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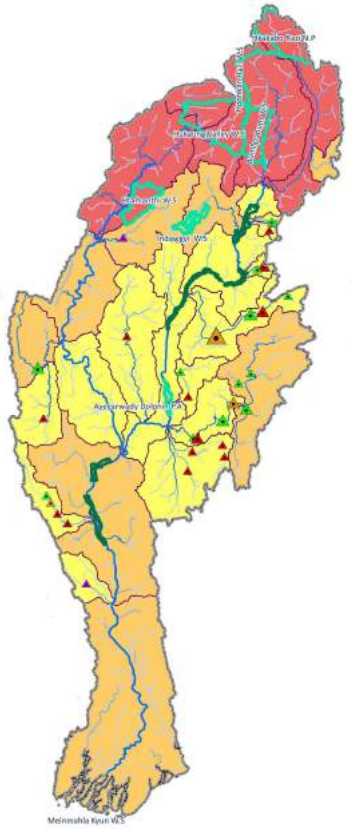
Myen Mung Hka Myihprap Wan Hte Seng Ai Zai Ninggawn Makau Grupyin Maram Dawdan Lam
Ga Laidung

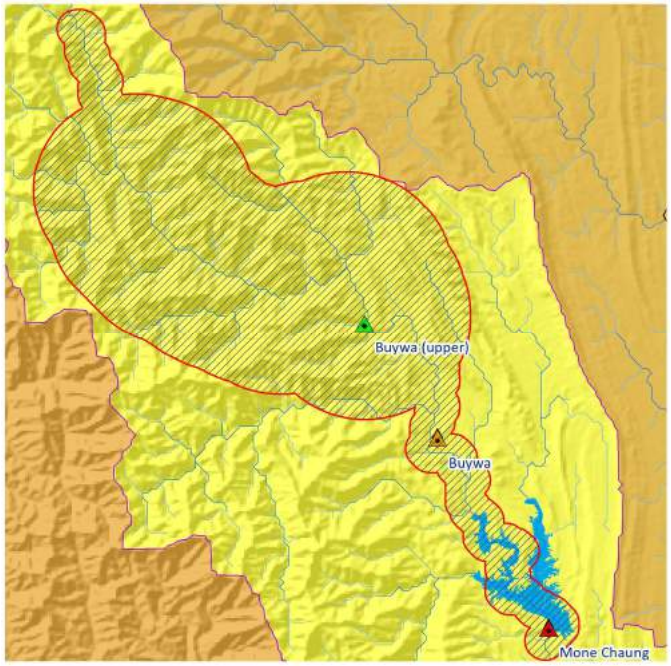
Integrated Planning Levels

Basin zoning



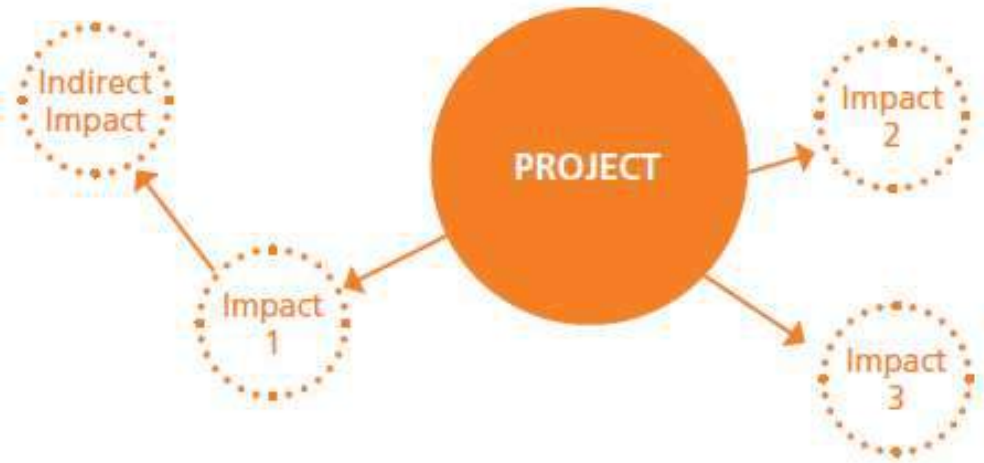
Sub-basin Cumulative Impact Assessment (CIA)

Project Environmental Impact Assessment (EIA)

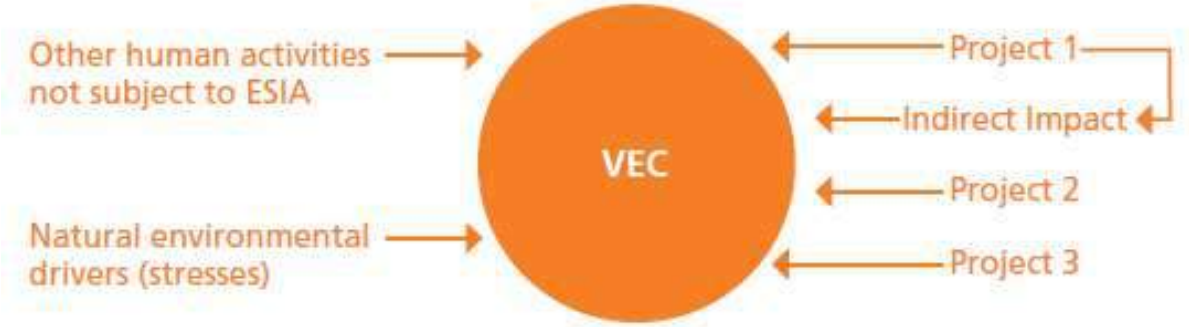


FOCUS: PROJECT CENTERED VS VEC CENTERED

ESIA



CIA



Cumulative Impacts

"The environmental and social impacts that result from the incremental impacts of one action/activity when added to past, present, and reasonably foreseeable future actions/activities."

Key Recommendations from SEA on CIAs

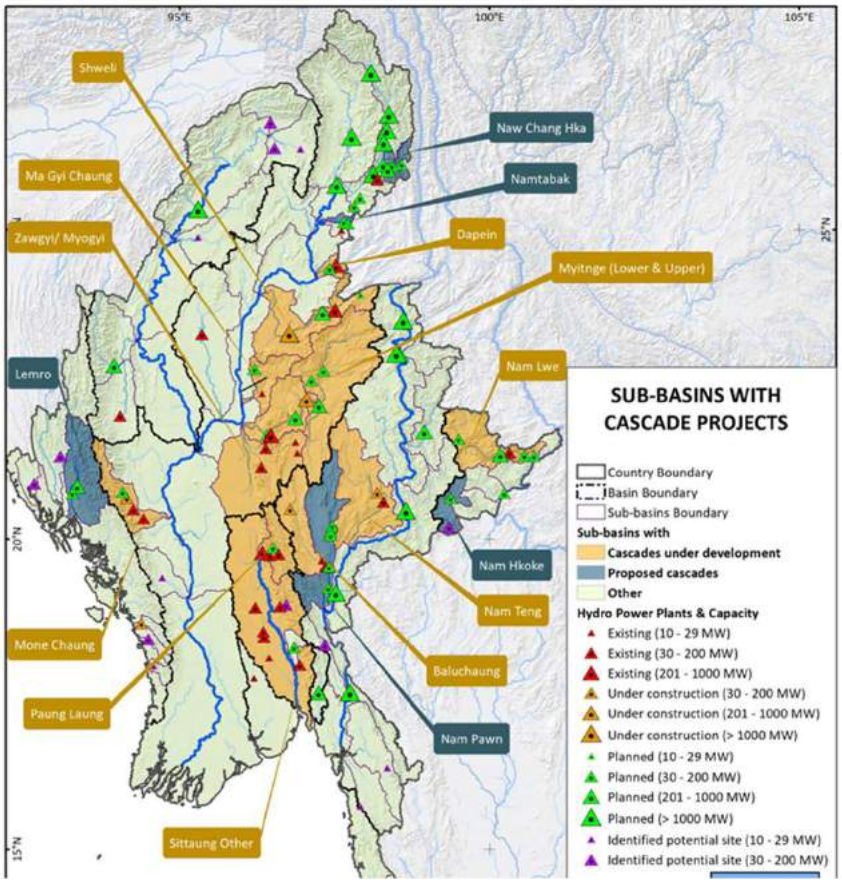
Cascade hydropower in selected sub-basins

- usually preferable to similar capacity in many sub-basins
- lower overall magnitude of impact per unit of energy
- increased power generation per unit of water regulated – multiple powerhouses generating from stored water

Myanmar already following this model

- 80% (3,912 MW) of existing / under construction projects in cascades
- ¾ of proposed projects in cascades
- 11 sub-basins with proposed HPPs have one or more operational projects

- CIA procedure should be developed and pilot CIAs should be conducted.



Vision for the Myitnge CIA

- The Myitgne CIA is the first pilot study at the sub-basin level to follow on from the SEA.
- It seeks to demonstrate how risks and opportunities that are often not captured in individual project Environmental and Social Impact Assessments (EIAs) can be identified and managed, leading to more holistic and sustainable basin development.
- The vision for the Myitgne CIA study is that sustainable planning for renewable energy options in the Myitnge River Basin is founded on:
    - a clear stakeholder commitment to assessing and managing cumulative impacts, and
    - collaborative monitoring and management.

Myitgne CIA Objectives

1. Plan and execute an integrated assessment of the cumulative impacts of renewable energy development in the Myitnge River Basin, including power development and optimization scenarios.

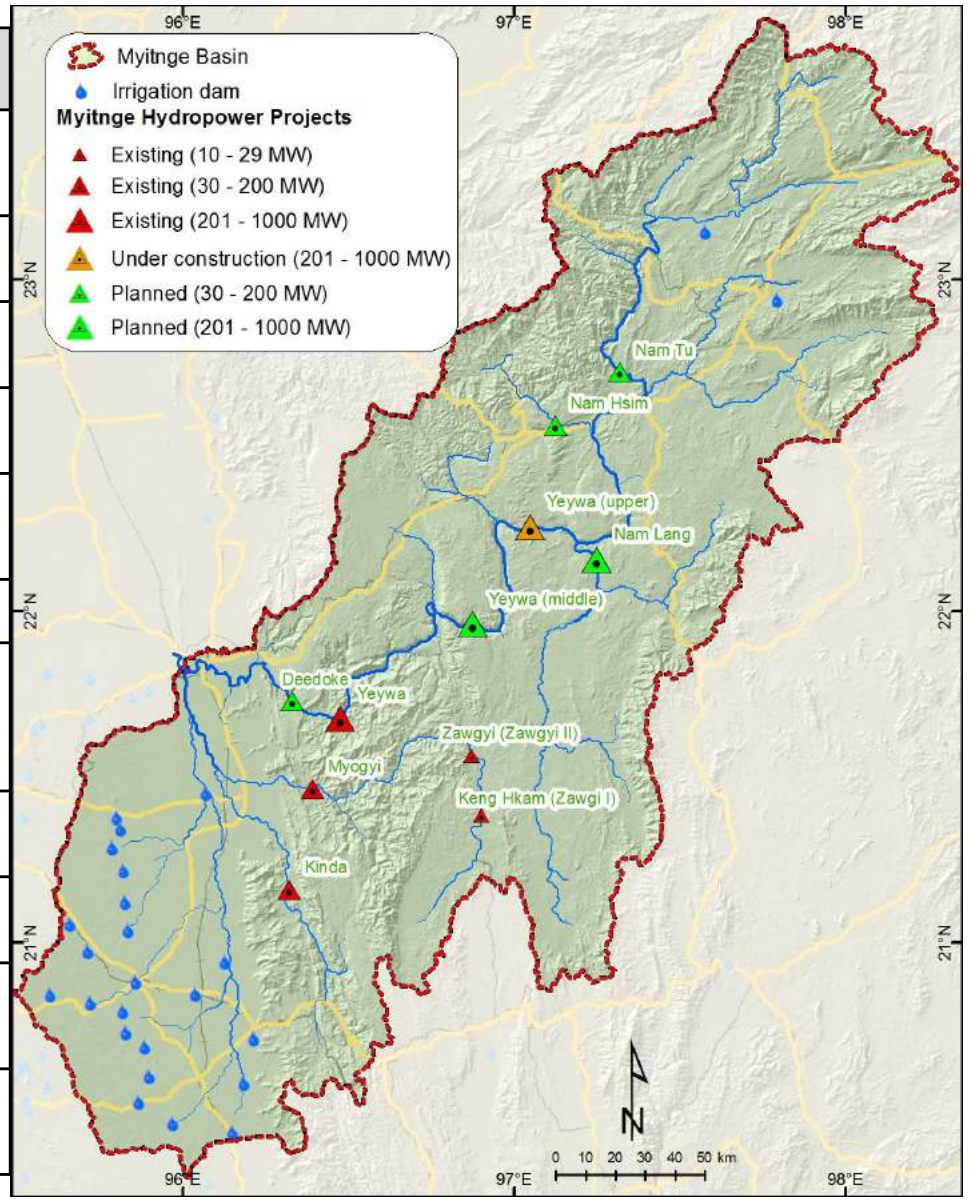
2. Lead the participatory design of a framework for ongoing river basin co-management in the Myitnge, including collaborative environmental and social impact monitoring and management.

3. Strengthen the capacity of Myitnge River Basin stakeholders in CIA and co-management.

IMPLEMENTATION PLAN FOR THE MYITNGE CIA

Myitnge Basin Energy Developments

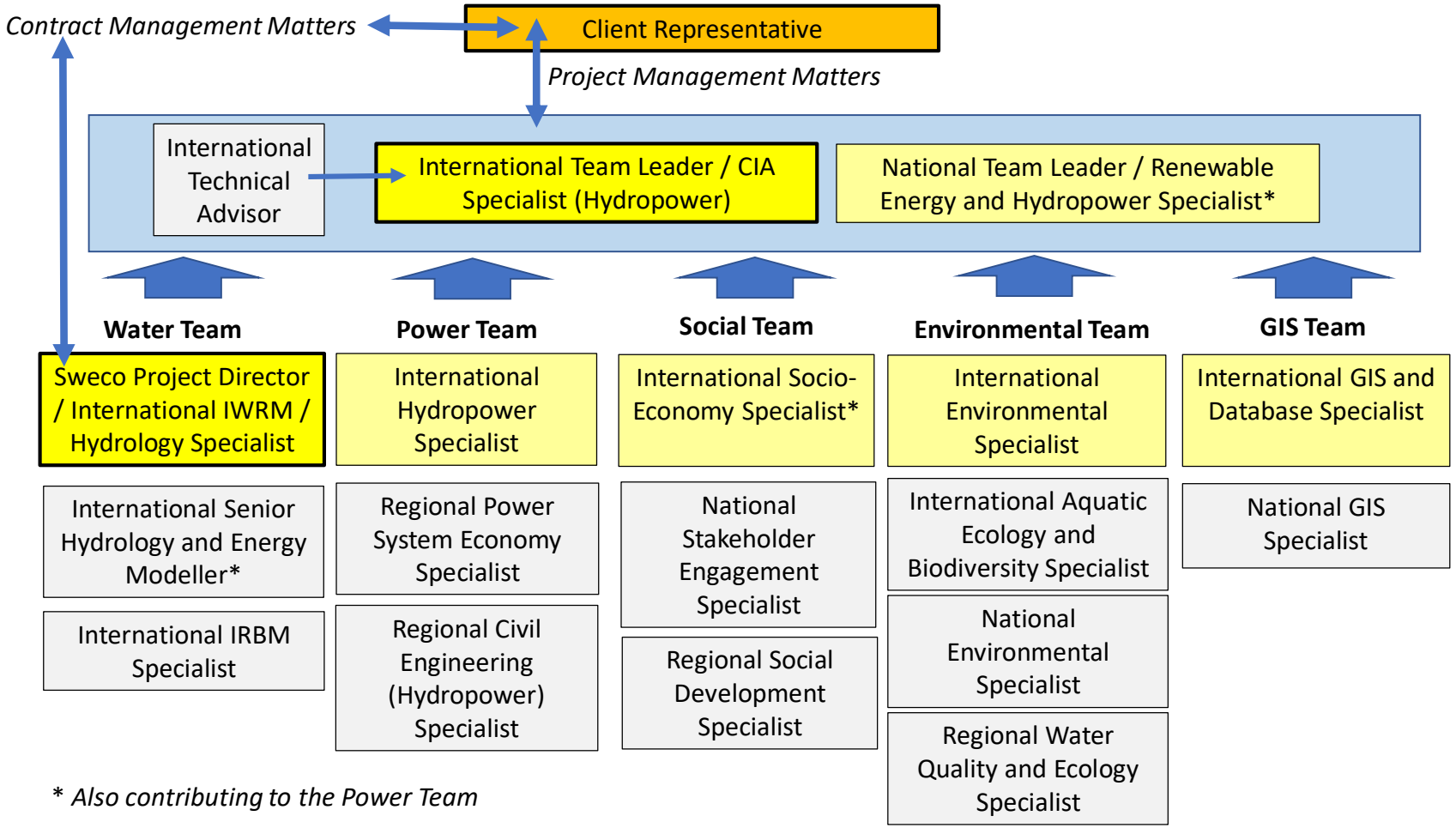
Area	Project	MW	Stage
Upper Myitgne	Nam Tu (Hsipaw)	210	MOU/ Feasibility report being reviewed
	Nam Hsim	30	MOU, preparing Feasibility Report
	Nam Lang	210	MOU, preparing Feasibility Report
Lower Myitgne	Upper Yeywa	280	Construction
	Middle Yeywa	735	MOU/ Feasibility report being reviewed, EIA submitted
	Yeywa	790	Operational
	Deedoke	60	Notice to Proceed (NTP)/ Feasibility done, EIA being reviewed by MONREC
Zawgyi	Kinda	56	Operational
	Myogyi	30	Operational
	Khen Hkam / Zawgyi I	6	Operational
	Zawgyi / Zawgyi II	12	Operational



The Consulting Team

- Dr Helen Locher, International Team Leader, CIA Specialist (Hydropower)
- Mr Tin Myint, National Team Leader, Renewable Energy and Hydropower Specialist
- Mr Carsten Staub, Sweco Project Director, International IWRM/Hydrology Specialist
- Dr Bernt Rydgren, International Technical Advisor
- Ms Tove Lilja, International Integrated River Basin Management (IRBM) Specialist
- Mr Anders Söderström, International Hydrology and Energy Modelling Specialist
- Mr Jörgen Dath, International Hydropower Specialist
- Mr Anh Tuan Nguyen, Regional Power System Economy Specialist
- Mr Le Quang Huy, Regional Civil Engineering (Hydropower) Specialist
- Dr Jörg Hartmann, International Socio-economy Specialist
- Dr Siriluck Sirisup, Regional Social Development Specialist
- Ms Lwin Lwin Wai, National Stakeholder Engagement Specialist
- Dr Lois Koehnken, International Environmental Specialist
- Mr Thomas Boivin, International Aquatic Ecology and Biodiversity Specialist
- Mr Nipat Somkleeb, Regional Water Quality and Ecology Specialist
- Mr Maung Maung Than, National Environmental Specialist
- Dr Nils Kellgren, International GIS and Database Specialist
- Ms Chaw Nu, National GIS Specialist

Team Organization



Project Stages and Timing

Stage 1 –
Background Information

Stage 2 –
State of the Myitnge Basin

Mobilization visit – 7-22 Jan 2019 – Yangon and NPT

Stage 3 –
CIA Scoping

Discussed at Inception Workshop – 13-14 Feb 2019 - NPT

Stage 4 –
Base Case Cumulative Impact Analyses

Discussed at Interim Workshop – 24-25 Apr 2019 - Mandalay

Stage 5 –
Alternative Scenarios Cumulative Impact Analyses

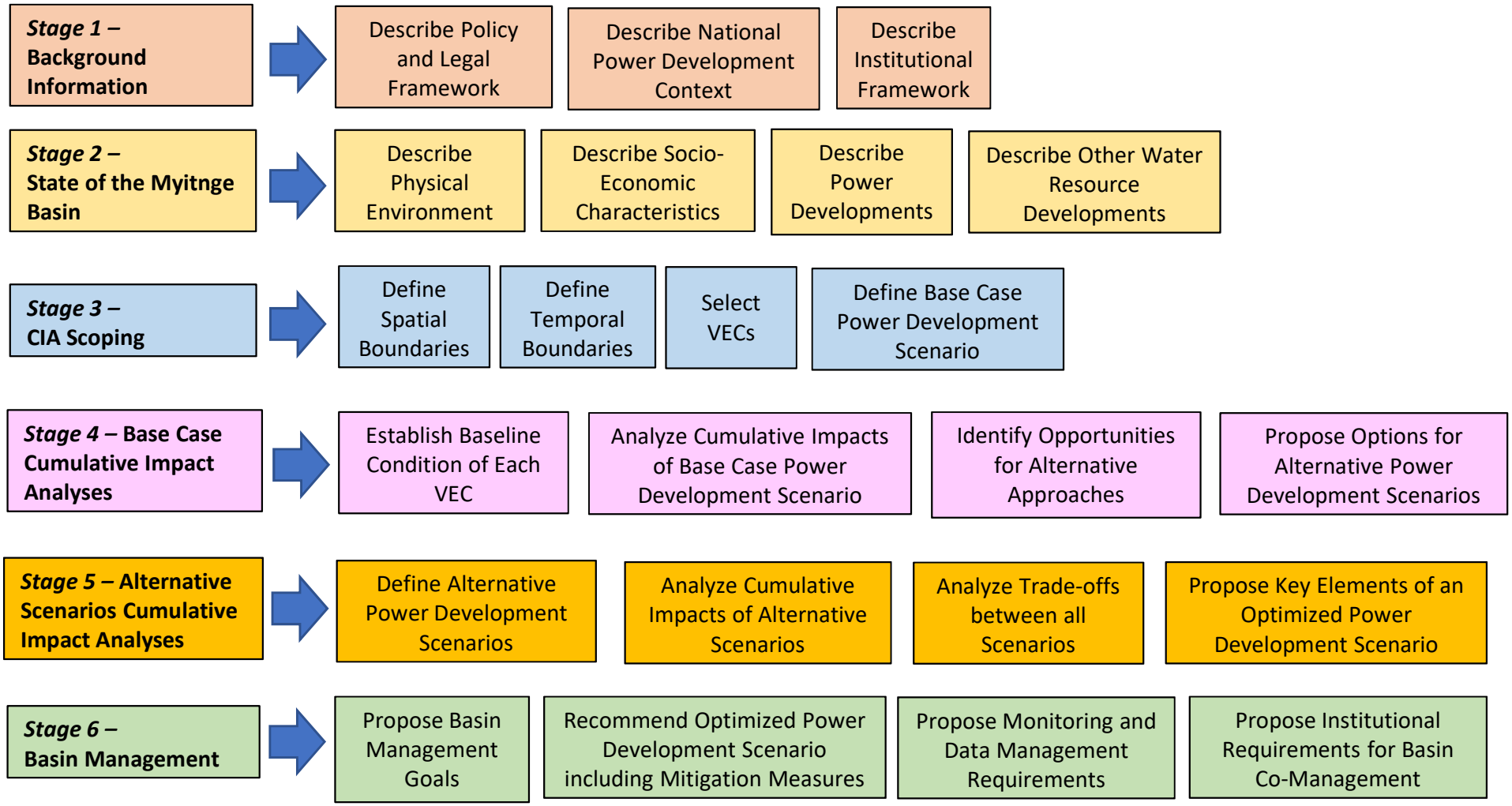
Discussed at Integrated CIA Workshop – 2-3 Jul 2019 - NPT

Stage 6 –
Basin Management

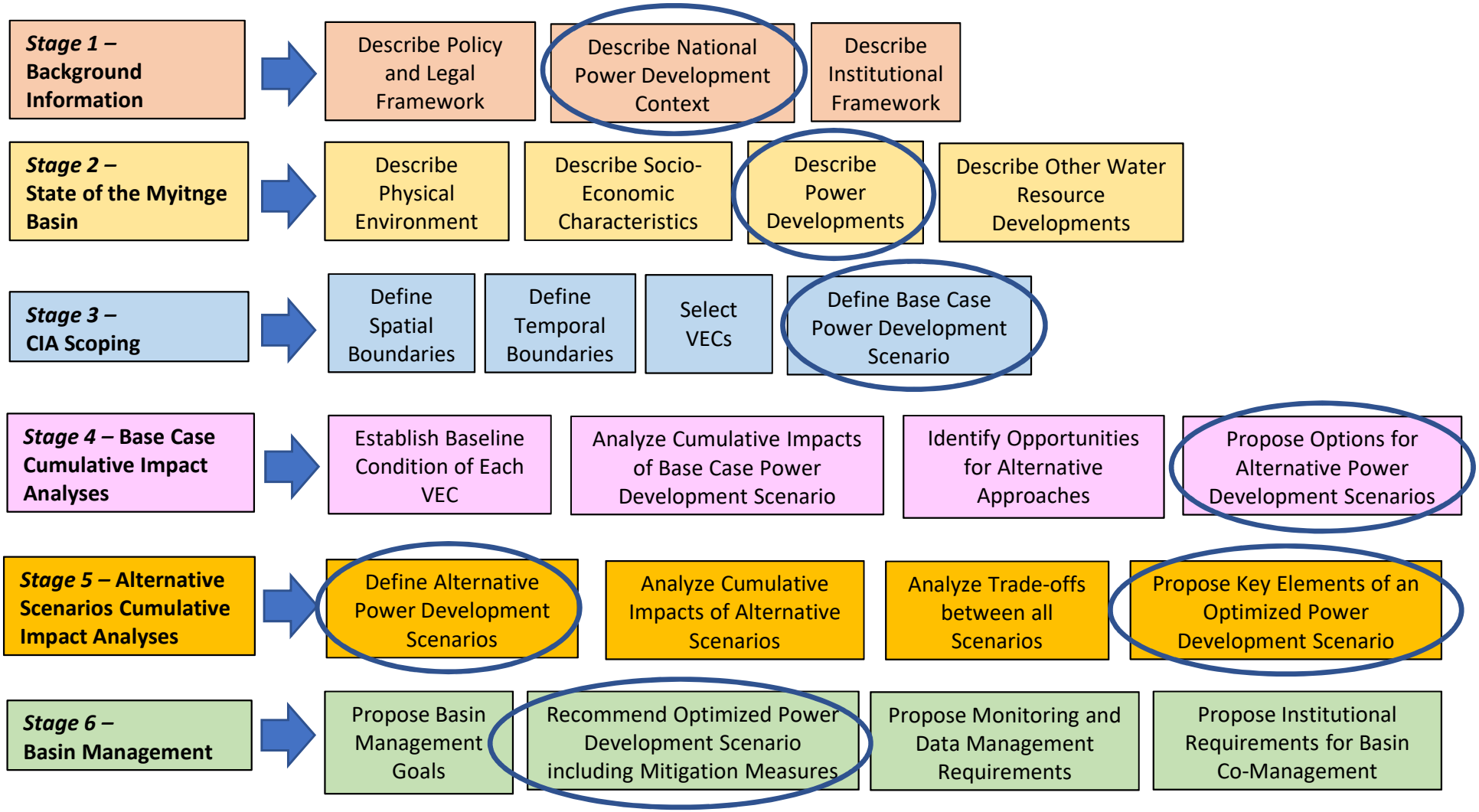
Presented at Basin Management Workshops – 20 and 22 Aug 2019 - Lashio and Mandalay

Project Finalization – Final Project Workshop – 18-19 Sep 2019 - NPT

Focal Areas for Each Stage



How Power Optimization is Integrated into the CIA



How the term “optimization” is used in this study

- “**Optimized**” in the context of this study is proposed to mean “*the best fit for power development in the basin, based on an iterative process with stakeholders to evaluate cumulative impacts*”.

- The intention of the study is to describe in more detail the power development impacts, and the trade-offs between environment and social impacts with energy objectives.

- The word “optimized” is often used at finer scales to test alternatives that would achieve better outcomes (e.g. optimization of power generation planning between Yeywa and Deedoke).

- In this study the word “optimized” is used primarily in relation to the final recommended power development scenario.

- This is the optimized power development scenario that is recommended in Stage 6, that takes into account measures to avoid, minimise, mitigate and compensate cumulative impacts, achieving the highest power development benefits at the same time (e.g. optimal generation mix, maximum capacity and generation outputs at least cost, optimal transmission route, etc.).

Major Stakeholder Engagement Activities

Mission	Dates	Activities
1	11-17 Jan	11/1 - Introduction mtgs with government (Nay Pyi Taw) 14-17/1 - 1:1 introduction mtgs with stakeholders (Yangon)
Early Feb		Basin Consultations 1 – to introduce the CIA study, learn about local issues and concerns
2	13-14 Feb	13-14/2 - Inception Workshop (NPT) – introduce project and plans, discuss CIA scoping matters 14/2 - CG Meeting 1 (NPT)
3	24-25 Apr	24-25/4 - Interim Workshop (Mandalay) – review Base Case CIA, discuss issues and alternative scenarios 24/4 - CG Meeting 2 (Mandalay)
Early May		Basin Consultations 2 – share Base Case CIA findings, discuss issues and alternative scenarios
4	2-3 Jul	1/7 – CG Meeting 3 (NPT) 2-3/7 – Integrated CIA Workshop (NPT) - present results of Integrated CIA, discuss issues and basin management
Mid July		Basin Consultations 3 – share Alternative Scenarios CIA findings, discuss issues and basin management
5	20-22 Aug	20/8 – CG Meeting 4 (Mandalay) 20/8, 22/8 – Basin Management Workshops (Lashio, Mandalay)
6	16-20 Sep	18-19/9 - Final Workshop – Present final project findings, recommendations and learnings (NPT) 19/9 – CG Meeting 5 (NPT)

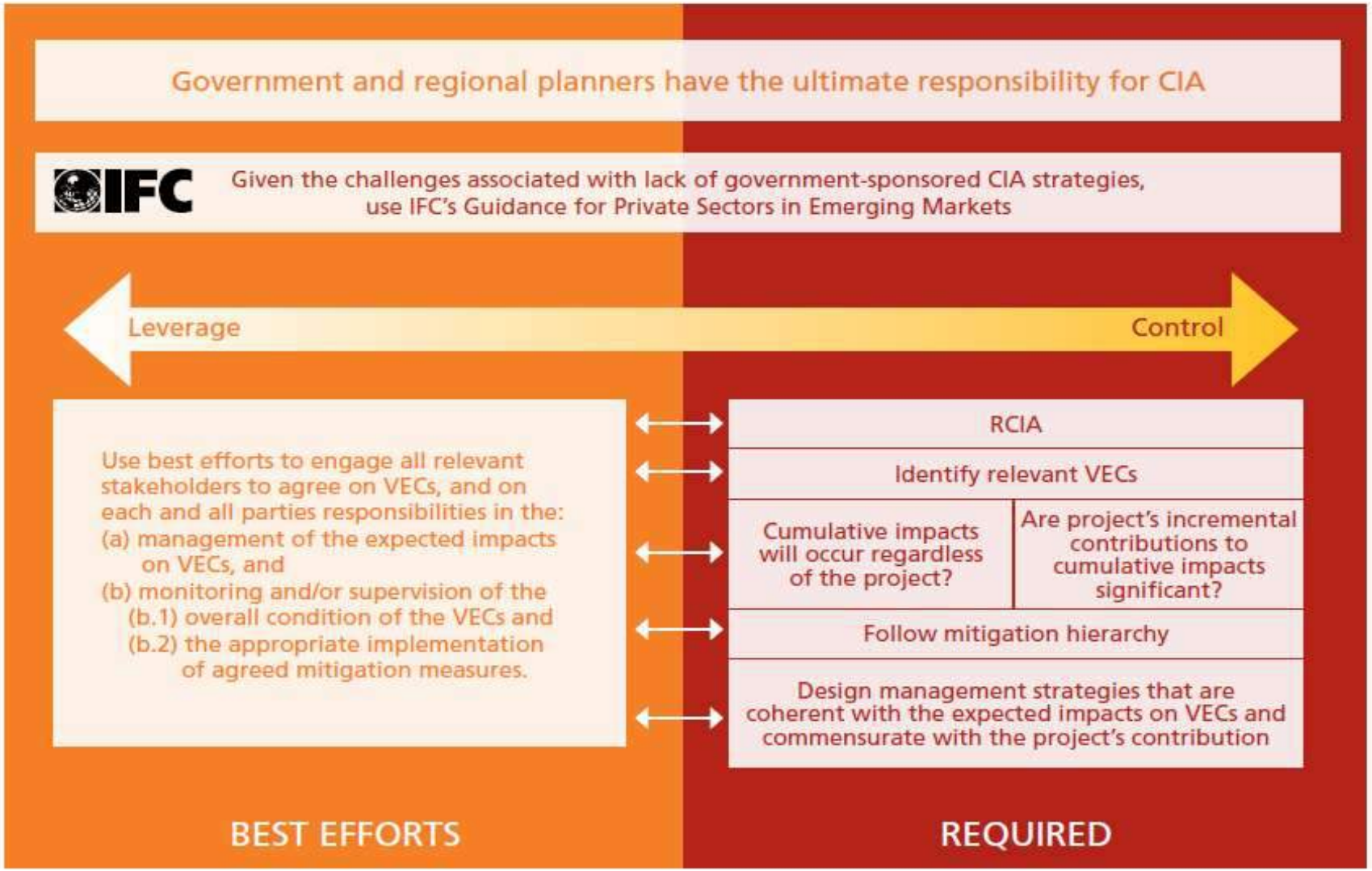
Capacity Building Integrated into Workshops at the End of Each Project Stage

Stage 3 – **CIA Scoping**	**Inception Workshop (13-14 Feb) -** Capacity Building Focal Areas: - Introduction to and Experiences with CIA; CIA Scoping; Valued Environmental and Social Components (VECs)
Stage 4 – **Base Case Cumulative Impact Analyses**	**Interim Workshop (24-25 Apr)** – Capacity Building Focal Areas: - Key issues emerging from the Base Case CIA – understanding mitigation approaches - Defining alternative basin power development scenarios – methods, global approaches, guidance
Stage 5 – **Alternative Scenarios Cumulative Impact Analyses**	**Integrated CIA Workshop (2-3 Jul)** - Capacity Building Focal Areas: - Key issues emerging from the Alternative Scenarios CIA – designing a management framework - Optimization of power development scenarios - methods, global approaches, guidance
Stage 6 – **Basin Management**	**Basin Management Workshops (20, 22 Aug)** – Capacity Building Focal Area: - Orientation to the Basin Co-Management Framework – roles, responsibilities, actions, sustainability
Project Completion	**Final Workshop (18-19 Sep)** –Capacity Building Focal Areas: - Guidance on integration of power optimization into CIA – lessons for future basin CIA studies

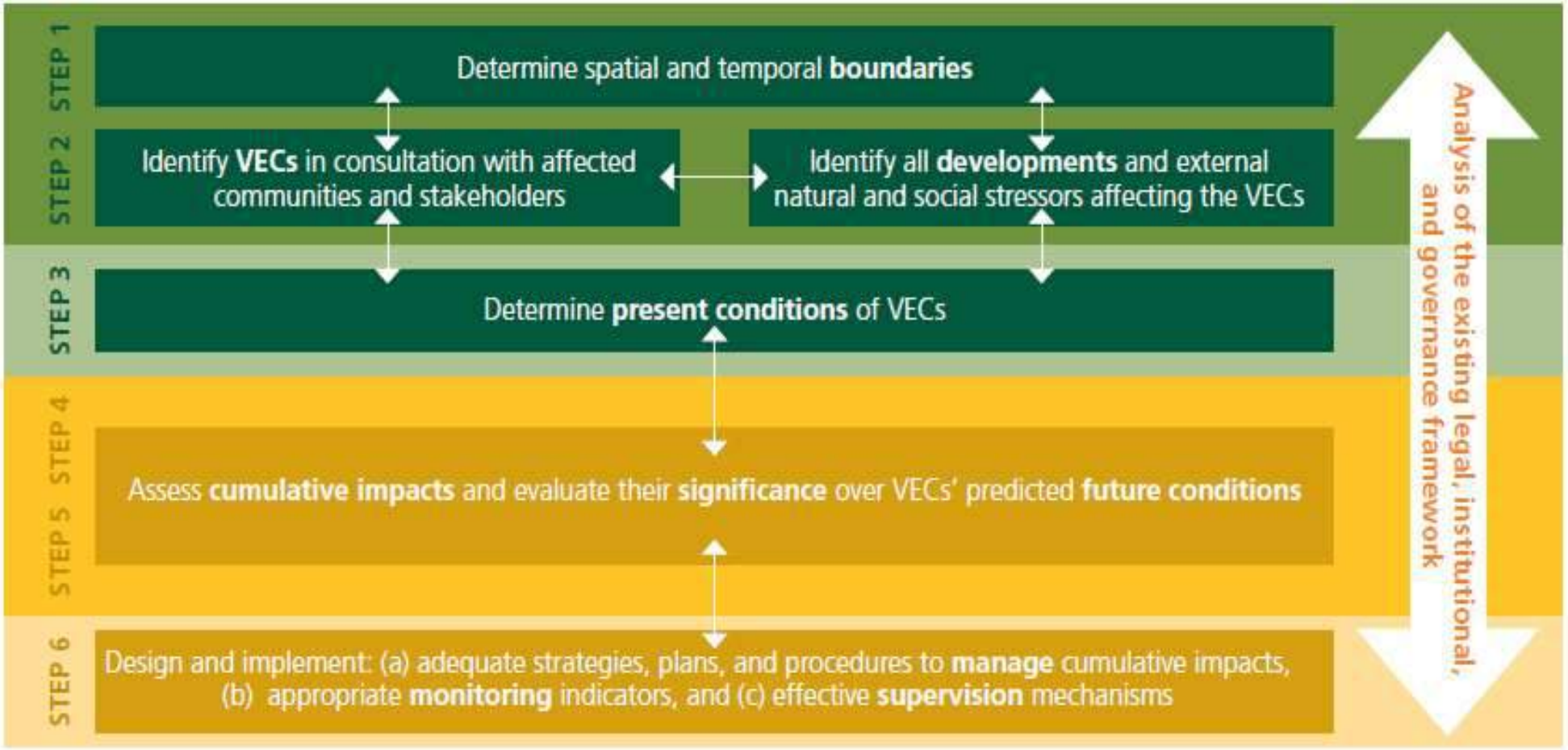
CAPACITY-BUILDING
INTRODUCTION TO AND EXPERIENCES WITH CIA

THE ROLE OF CIA AND STEPS FROM THE IFC GOOD PRACTICE GUIDE

IFC CIA Approach



CIA 6-STEP PROCESS



Valued Environmental and Social Components

- It is good practice to focus cumulative impact assessment and management strategies on Valued Environmental and Social Components (VECs).
- The acronym VECs refers to sensitive or valued receptors of impact whose desired future condition determines the assessment end points to be used in the CIA process.
- VECs are environmental and social attributes that are considered to be important in assessing risks; they may be:
    - physical features, habitats, wildlife populations (e.g., biodiversity),
    - ecosystem services,
    - natural processes (e.g., water and nutrient cycles, microclimate),
    - social conditions (e.g., health, economics), or
    - cultural aspects (e.g., traditional spiritual ceremonies).
- VECs are often affected by the cumulative effects of several developments.
- VECs are the ultimate recipient of impacts, and tend to be at the ends of impact pathways.

Role of Government vs Private Sector

- Total cumulative impacts due to multiple projects – should be identified in **government sponsored assessments** and **regional planning** efforts
- IFC requires clients to determine the degree to which each project contributes to the cumulative effects

The IFC GPH acknowledges:

- Actions over which a private sector sponsor has direct control
- And those for which it may leverage to influence others to achieve optimal cumulative impact management as part of a multi-stakeholder effort (ideally led by government)

Roles & responsibilities for Government

- Establish **legal and regulatory framework** for CIA
- Establish and **lead regional planning structures** and collaborative **mechanisms for managing and mitigating** cumulative impact
- Implement **permitting process that considers cumulative impacts** of all developments and pressures
- **Design and conduct CIA study** of geographic area which includes baseline conditions and predict future baselines
- **Issues approval to individual private sector** projects to be developed on the basis of this information
- **Lead development and implementation of regional cumulative impact monitoring programs** that analyses development pressures and impacts at regional scale and compares results to values and/or acceptable limits for resource development

Roles & responsibilities for Private Sector

Design and conduct CIA study of the incremental impacts of the project building on the CIA study conducted by the government

Monitor and manage cumulative impacts and risks related to the development for its life span

Provide project-level cumulative impact monitoring data to regional cumulative impact monitoring program

Support regional planning structures and collaborative mechanisms for managing cumulative impacts to prevent their limits from being reached, actively participate as needed in collaborative systems with government, private sector and public.

Expected Outcomes for a CIA

- Identification of relevant VECs that may be potentially affected by the development (Stakeholders engagement);
- Assessment/estimation of the future condition of affected VECs, as the result of the cumulative impact of the project with other reasonably predictable projects and natural influences;
- Evaluation of the future condition of the VECs relative to threshold(s) of VEC condition (Stakeholders engagement);
- Avoidance and minimization of the development's impact on the VECs for the life of the development;
- Monitoring and management of impacts and risks to the project over its life-span from VECs reaching their limits (Stakeholders engagement);
- Compilation and sharing of project-related monitoring and VEC condition data to governments and other stakeholders for the life of the development.

BREAK

GLOBAL EXPERIENCES AND LESSONS LEARNED FROM HYDROPOWER CIAs

Global Development of Hydropower CIA Experience

- Over the past ~10 years, countries have increasingly used multi-criteria analysis (MCA) in hydropower inventory studies to support master planning at a national level.
- CIA builds on this approach by considering scenarios and focussing on VECs.
- Published examples of recent basin-scale hydropower CIA studies based on VECs include:
  - ***Chile*** – Alto Maipo project[2]
  - ***Pakistan*** – Poonch River project[3]
  - ***Vietnam*** - multiple basins with small projects[4].
- Related approaches include SEA, basin studies and ”hydropower by design”.
- None of these studies is the perfect example for the Myitnge study, but all provide useful learnings and inputs to help shape the planned CIA methodology.

[2] AES Gener (2014) Alto-Maipo Hydro-Electric Project Cumulative Effects Statement. Chile
[3] Hagler Bailly Pakistan (2014) Cumulative Impact Assessment conducted for Mira Power Limited, Islamabad
[4] ASTAE (Asia Sustainable and Alternative Energy Program). 2014. *Cumulative Impacts and Joint Operation of Small-Scale Hydropower Cascades.* South Asia Energy Studies. Washington, DC: World Bank

Learnings from Global Hydropower CIA Experiences

- Cumulative impacts are often not simply positive or negative, and can have different interactive pathways. Also, previously unforeseen impacts can emerge when individual impacts interact.
- Impact pathways for cumulative impacts can be:
  - ***Strictly additive*** – the sum of individual impacts equals the total impact
  - ***Synergistic*** – the total impact is more than the sum of individual impacts
  - ***Antagonistic*** – the total impact is less than the sum of individual impacts
- Threshold levels, or limits of acceptable change, are important points to consider.
- Because of the multiple cause-effect variables and pathways, a focus on a set of VECs makes the analysis feasible.
- Impact mapping can help to identify the causes, impact pathways, and consequences on important receptors (i.e. VECs).

Selecting VECs –
Example approach from the Alto Maipo CIA study in Chile

- The initial list of potential VECs was identified through issues raised in SEIAs, regional issues of interest, and issues raised by stakeholders.

Potential VECs:
- river continuity
- biodiversity in water courses
- flow of watercourses
- security in the availability of water for irrigation
- surface water quality
- recreational uses of watercourses
- sediment dynamics
- social economic environment
- local infrastructure especially the major road traffic routes
- air quality
- cultural and archaeological heritage
- climate change,
- protected areas
- areas of tourism, cultural or heritage interest.

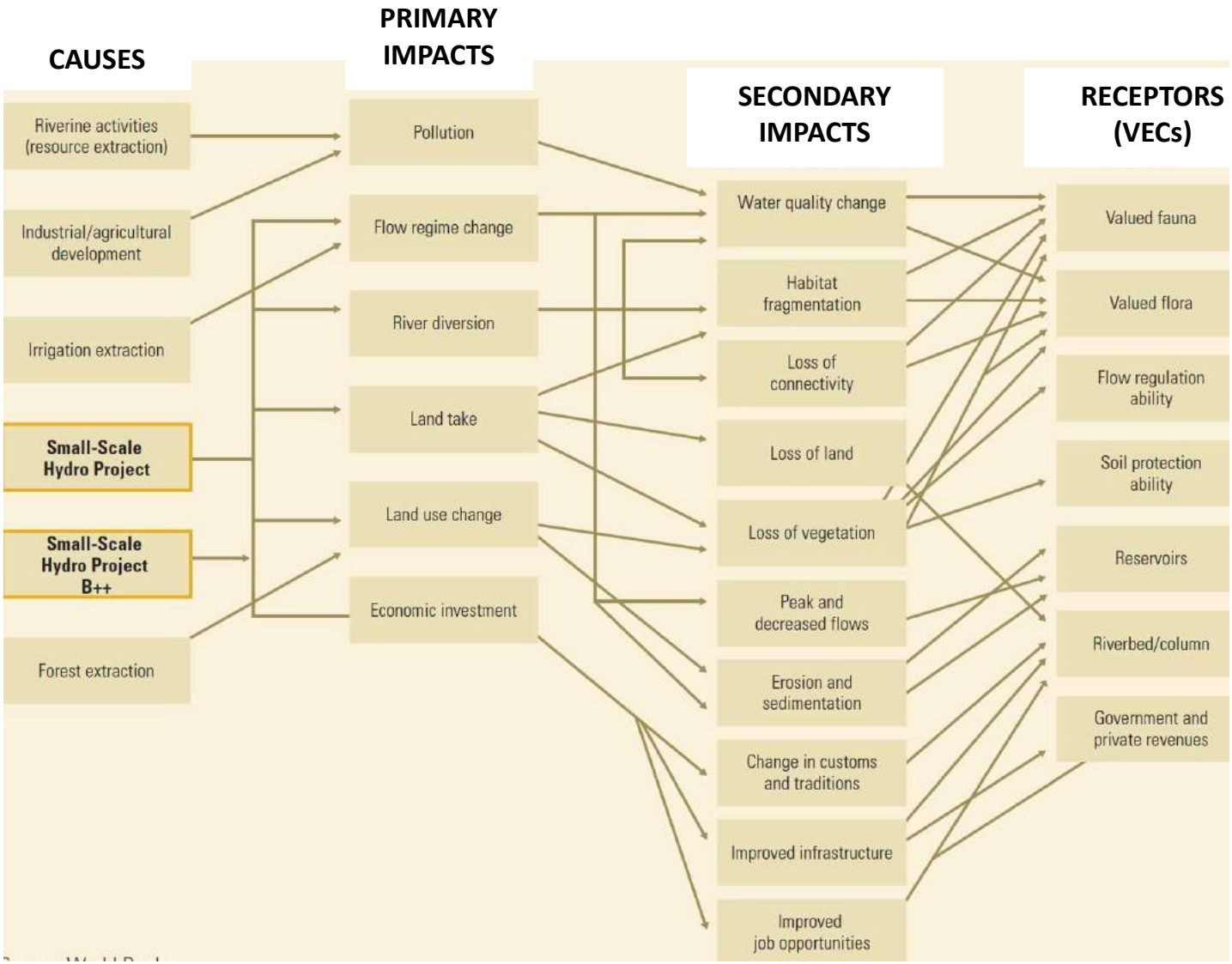
VECs for CIA study:
- surface hydrology
- sediment dynamics
- landscape
- local communities

- The selected VECs were based on degree of importance, and degree of influence by hydropower and cumulative impacts.

Some Examples of VECs in Selected Previous Studies

Alto Maipo CIA, Chile	Small Hydro CIA, Vietnam	Poonch River CIA, Pakistan	Alaknanda and Bhagirathi basins CIA, India	Don Sahong HPP CIA, Mekong River	Mtkvari HPP CIA, Georgia	Myitnge Hydropower-by-Design Study
Surface hydrology	Valued fauna	Surface water quantity (flow)	Aquatic ecology and fish diversity	Minimum flows	Physical environment	Fish biodiversity
Sediment dynamics	Valued flora	Sediment (sand and gravel)	Terrestrial flora and fauna	Fish migration	Biological environment	Forest loss
Landscape	Ecosystem flow regulation ability	Resident and migratory fish species			Socio-economic environment	Sediment load
Local communities	Ecosystem soil protection ability	Landscape				Flood control
	Riverbed and water column					Navigation
	Project-affected people		**KEY**			Displaced people
	Reservoirs		Environmental			Fishery support
	Government and private revenues		Social			Annual generation
			Economic			Firm generation
						Capital expenditure

Understanding Cumulative Impacts through Mapping Impact Pathways – *example from Vietnam*



Longitudinal Impact Ratings – *example from Pakistan*

The Poonch River CIA study mapped changes in impact with distance downstream of the national border using an impact rating system.

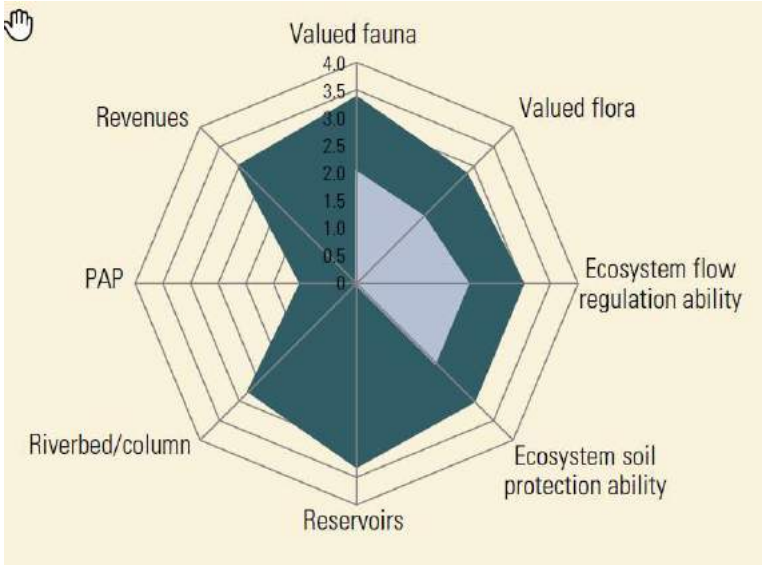
B = blue, B/C and C = green, C/D = white, D = orange, No river remaining = red

River Reach		*2013*	*Sequential implementation of:*				
			Gulpur HPP	*Parnai HPP*	*Sehra HPP*	*Kotli HPP*	*Rajdhani HPP*
Poonch River upstream of LoC	Parnai weir to LoC	B	B	C/D	C/D	C/D	C/D
Poonch River downstream of LoC	LoC - 5 km	B/C	B/C	C/D	D	D	D
	10	B/C	B/C	C	No river remaining	No river remaining	No river remaining
	15	B/C	B/C	C	D	D	D
	20	B/C	B/C	C	D	D	D
	25	B/C	B/C	C	D	D	D
	30	B/C	B/C	C	C	No river remaining	No river remaining
	35	B/C	B/C	C	C	D	D
	40	B/C	B/C	C	C	D	D
	45	B/C	No river remaining	No river remaining	No river remaining	No river remaining	No river remaining
	50	B/C	No river remaining	No river remaining	No river remaining	No river remaining	No river remaining
	55	B/C	D	D	D	D	No river remaining
	60	B/C	B/C	B/C	C	C/D	No river remaining
	65	B/C	B/C	B/C	C	C/D	No river remaining
	70	B/C	B/C	B/C	C	C/D	No river remaining
	75	B/C	B/C	B/C	C	C/D	D
	80	B/C	B/C	B/C	C	C/D	D
	85	B/C	B/C	B/C	C	C/D	D
	90	B/C	B/C	B/C	C	C/D	D
Mendhar Nullah		B	B	D	D	D	D

Quantifying cumulative impacts and presenting results – *example from Vietnam*

- The Vietnam CIA study used an impact rating system to quantify cumulative impacts for each VEC under the various scenarios.
- The results were shown in tabular form and with spider diagrams, and enabled comparative results to be shown for different cases for different river basins.

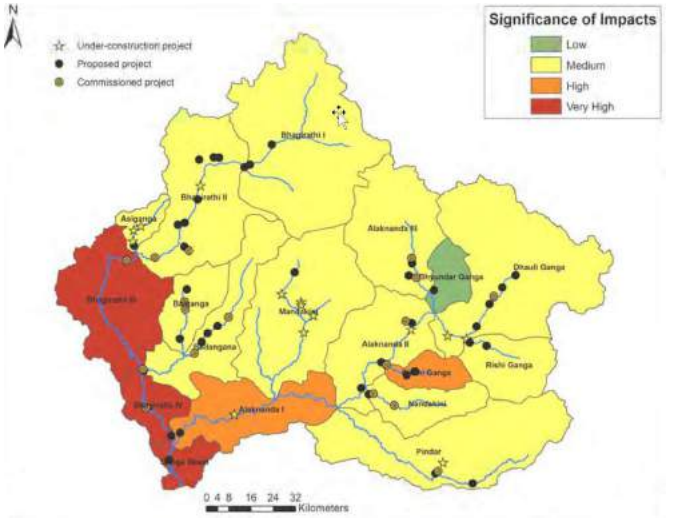
Receptor or VEC	Case 0	Case 1
Valued fauna	2.0	3.36
Valued flora	1.7	2.80
Flow regulation ability	2.0	3.00
Soil protection ability	2.0	3.00
Reservoirs	0	3.30
Riverbed and water column	0	2.75
Project-affected people	0	1.00
Government and private revenues	0	3.00



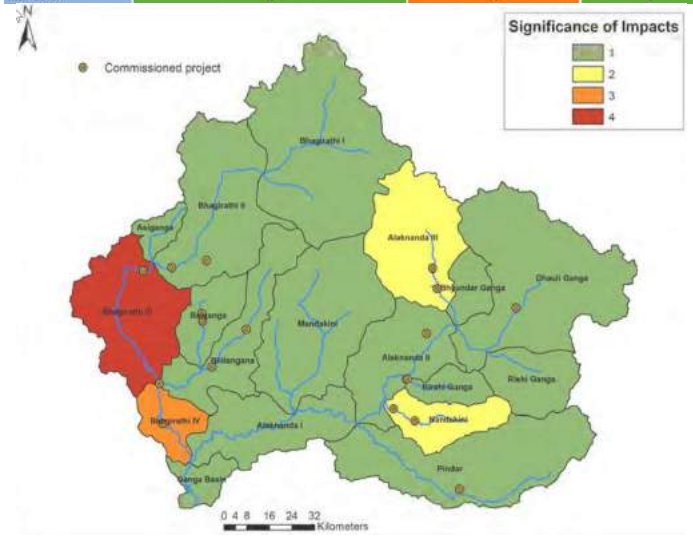
Summary Maps Showing Cumulative Impact Ratings by River Sub-Basin – *Example from India*[4]

A CIA focussed on biodiversity impacts in two basins in India developed colour-coded impact ratings, and used these to illustrate tables and maps, allowing an easy visual comparison amongst scenarios.

Name of sub-basin	Impact potential based on project profile*	Aquatic biodiversity value	Impacts significance
Bhagirathi I	M	M	M
Bhagirathi II	M	H	M
Asiganga	M	H	M
Bhagirathi III	VH	H	VH
Bhagirathi IV	H	VH	VH
Bhilangana	M	H	M
Balganga	M	H	M
Alaknanda I	M	VH	H
Mandakini	M	H	M



Name of sub-basin	Impact potential based on project profile*	Aquatic biodiversity value	Impacts significance
Bhagirathi I	L	M	L
Bhagirathi II	L	H	L
Asiganga	L	H	L
Bhagirathi III	VH	H	VH
Bhagirathi IV	M	VH	H
Bhilangana	L	H	L
Balganga	L	H	L
Alaknanda I	L	VH	L
Mandakini	L	H	L



[4] Rajvanshi et al (2012) Assessment of Cumulative Impacts of Hydroelectric Projects on Aquatic and Terrestrial Biodiversity in Alaknanda and Bhagirathi Basins, Uttarakhand. Wildlife Institute of India

Key Messages from Global CIA Experience for the Myitnge CIA

- There is no guidance or example that shows exactly how to analyse cumulative impacts from hydropower development.
- The common approach is to focus on VECs, map impact pathways, and assign cumulative impact ratings to use for comparative illustrations between scenarios.
- Rating systems can be simple or complicated. Of importance is that the indicators for VEC condition are defined, and that their rationale is clearly documented.
- Determinations of impact ratings need to be specific to each VEC. Consequently only a **small number of VECs is recommended (typically 4-6)**.
- Methods of presentation of results of hydropower CIAs have varied widely in the examples that we were able to review. Ideally the outcome is easily understandable for decision-makers through a mix of tables, plots and maps.
- Of very high importance is to understand what are the key questions that decision-makers are seeking to answer.

Important Questions for the Myitgne CIA

1. What are the important considerations, values and concerns within the basin that should be focussed on when considering potential cumulative impacts?
2. What cumulative impacts arise for the planned “Base Case” power development scenario?
3. What is possible to do differently? Where is there “room to move”?
4. What are some possible different power development scenarios, and what cumulative impacts are associated with these?
5. What is the best combination of adapted power development approaches and mitigation measures for environmental and social impacts?
6. How can we ensure that this “optimal” development scenario can be delivered?

EXPLANATION OF THE CUMULATIVE IMPACT ASSESSMENT MATRIX (CIAM)

Explanation of the CIAM Tool

- The Cumulative Impact Assessment Matrix (CIAM) is a variation of the Rapid Impact Assessment Matrix (RIAM) which is used for impact assessment studies. It was developed by Sweco for analysis of cumulative impacts in the Kuri-Gongri river basin in Bhutan, relating to various hydropower development scenarios.
- Steps:
  1. Selection of VECs and definition of scenarios.
  2. Each VEC is analysed and scored to provide the inputs for the CIAM assessment criteria. Analytical approaches are specific to each VEC.
  3. A populated CIAM matrix is produced, with an Evaluation Score (ES) and Range Value (RV) for each VEC and scenario.
  4. The populated CIAM matrix is used to illustrate the implications of various important basin management questions, such as:
     - Which scenario is best for power system objectives?
     - What is the influence of mitigation measures on lessening cumulative impacts?

CIAM Assessment Criteria

Each VEC is assigned numerical scores for two groups of Criteria, Group A and Group B.

The criteria scores are combined to produce an ***Evaluation Score (ES)*** for each VEC:

aT = a1*a2
bT = b1+b2+b3
ES = aT*bT

Group (A) criteria

Score	Scale of indicator (A1)	Magnitude of change/effect (A2)
4	Important to national /international interests	n/a
3	Important to regional / national interests	Major positive benefit
2	Important to areas immediately outside the local condition	Significant improvement compared to Status quo
1	Important only to local condition	Improvement to status quo
0	n/a	No changes/status quo
-1	n/a	Minor negative changes to baseline situation
-2	n/a	Significant negative changes to baseline situation
-3	n/a	Major changes to baseline situation

Group (B) criteria

Scale	Permanence (B1)	Reversibility (B2)	Cumulative (B3)
1	No changes/status quo	No changes/status quo	No change/Antagonistic
2	Temporary	Reversible	Additive
3	Permanent	Irreversible	Synergistic

Evaluation Scores determine the Range Values used for Comparisons and Trade-Off Analyses

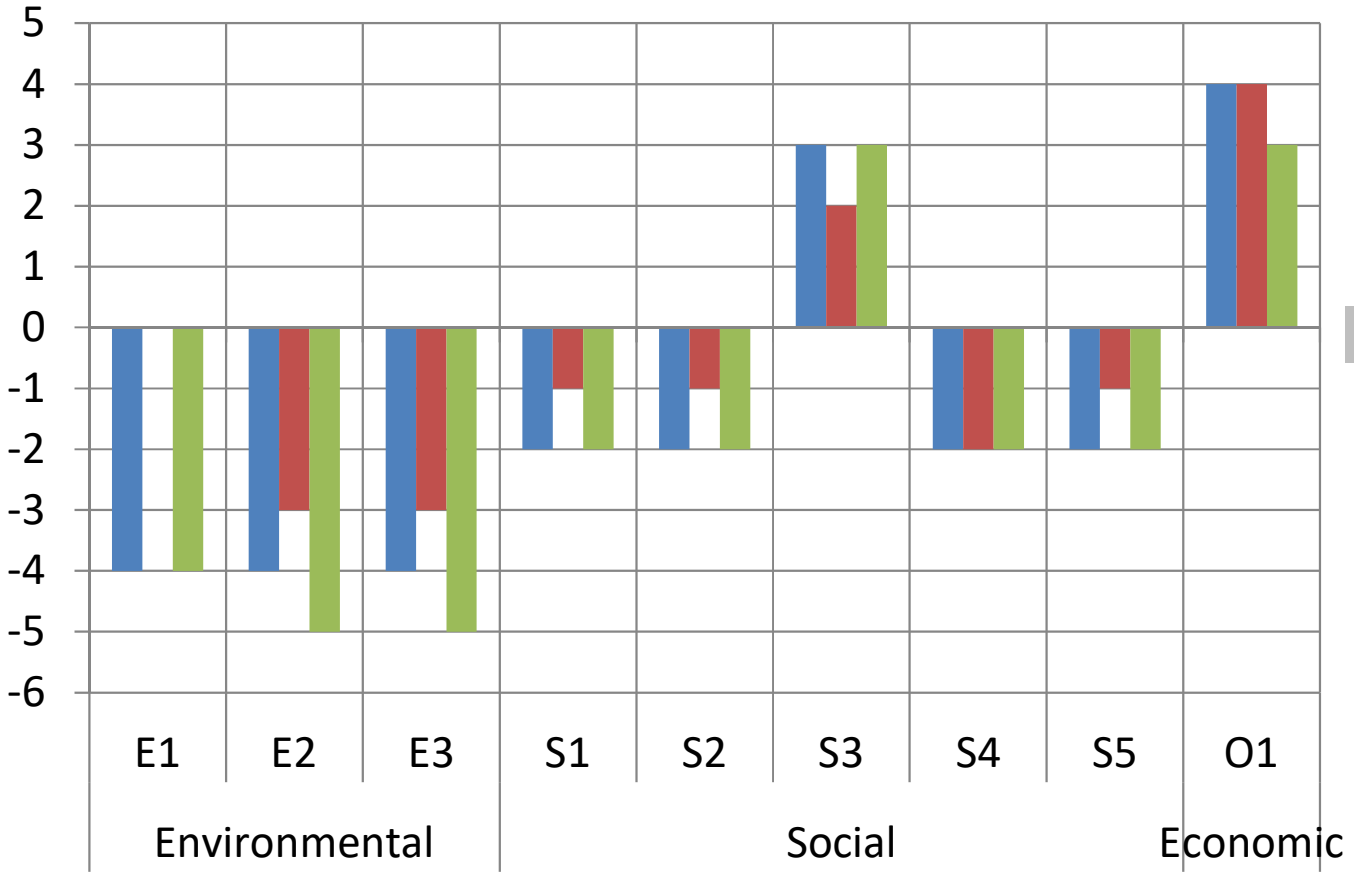
Evaluation Score (ES)	Range Value (RV)	Description of Range Band
72 to 108	5	Major positive change/impact
36 to 71	4	Significant positive change/impact
19 to 35	3	Moderate positive change/impact
10 to 18	2	Positive change/impact
1 to 9	1	Slight positive change/impact
0	0	No change/status quo/not applicable
-1 to -9	-1	Slight negative change/impact
-10 to -18	-2	Negative change/impact
-19 to -35	-3	Moderate negative change/impact
-36 to -71	-4	Significant negative change/impact
-72 to -108	-5	Major negative change/impact

Illustrative Example of CIAM Scoring

aT = a1*a2
bT = b1+b2+b3
ES = aT*bT

	Group A			Group B					
	Importance	Magnitude		Permanence	Reversability	Cumulative			
	A1	**A2**	**aT**	**B1**	**B2**	**B3**	**bT**	**ES**	**RV**
Scoring range	0-4	-3 to +3		1-3	1-3	1-3			
VECs									
Environmental									
Sediment dynamics	4	-2	-8	3	3	2	8	-64	**-4**
Terrestrial habitats	3	-2	-6	3	3	3	9	-54	**-4**
Aquatic habitats	3	-2	-6	3	3	3	9	-54	**-4**
Social									
Settlements and livelihoods	1	-2	-2	3	2	2	7	-14	**-2**
Cultural heritage	1	-2	-2	3	3	2	8	-16	**-2**
Non-farm commercial activities	2	2	4	3	3	2	8	32	**+3**
Public health and safety	1	-2	-2	2	2	2	6	-12	**-2**
Landscapes	1	-2	-2	3	3	2	8	-16	**-2**
Economic									
Security of domestic electricity supply	3	3	9	3	2	2	7	63	**+4**

Illustrative Example, continued: Comparative Assessment of Three Scenarios



Scenario X

Scenario Y

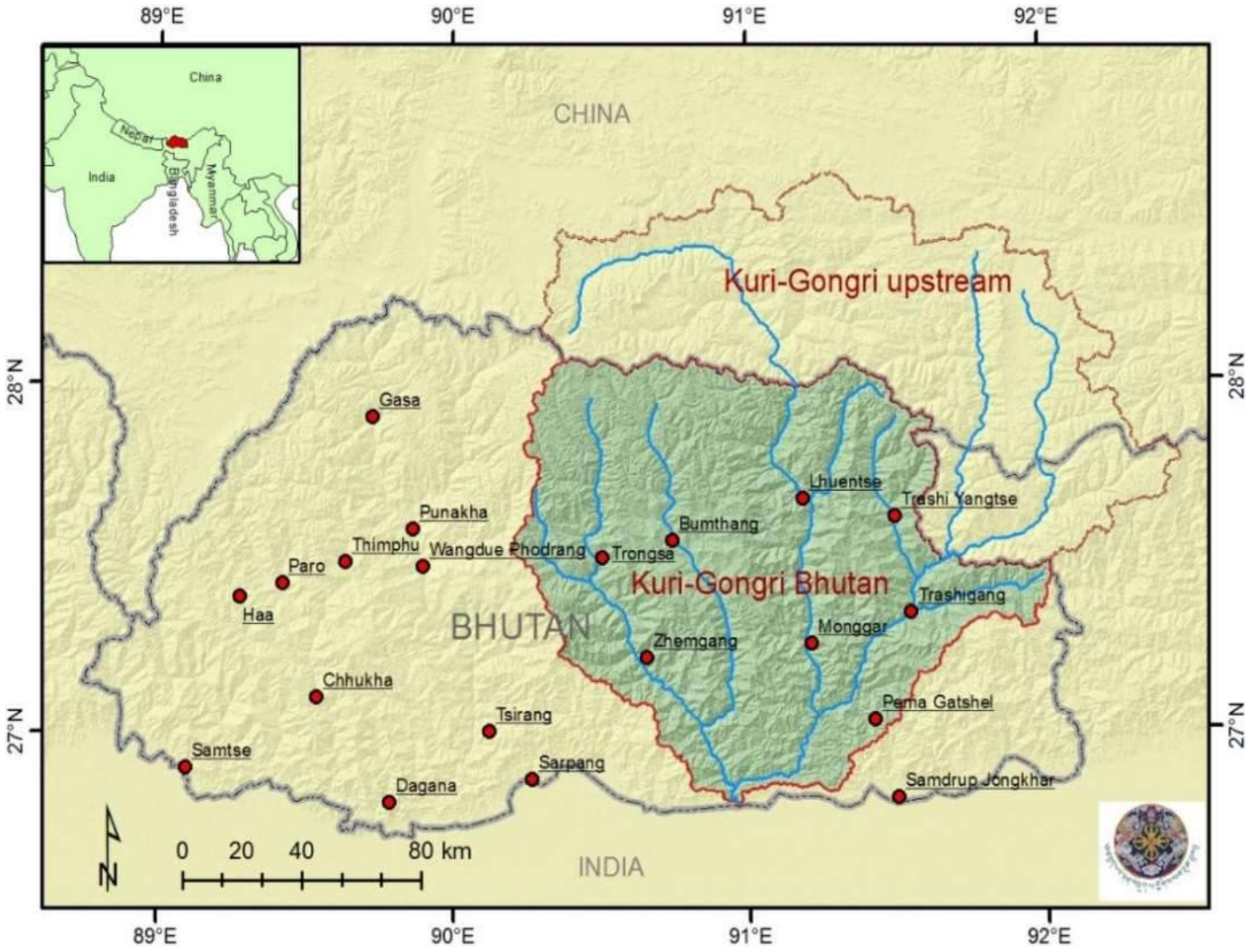
Scenario Z

RV	Description of range band
5	Major positive change/impact
4	Significant positive change/impact
3	Moderate positive change/impact
2	Positive change/impact
1	Slight positive change/impact
0	No change/status quo/not applicable
-1	Slight negative change/impact
-2	Negative change/impact
-3	Moderate negative change/impact
-4	Significant negative change/impact
-5	Major negative change/impact

Merits of the CIAM Approach

- The CIAM approach is suitable for multi-disciplinary studies involving many different expert areas, and scenario analyses characterised by scarce input data and high uncertainty in future projections
- CIAM allows impacts on VECs to be analysed and illustrated in a transparent manner.
- Once CIAM is set up, it can be re-applied to test the conclusions based on better field data and to investigate future alternative scenarios or development proposals.

CASE STUDY: KURI-GONGRI RIVER BASIN CIA, BHUTAN



Cumulative Impact Assessment of hydropower in the Kuri-Gongri Basin – an overview

- The Kuri-Gongri CIA was conducted to support the formulation of a strategic roadmap for sustainable hydropower development in Bhutan.
- The aim was to use basin-wide baseline data and trends to assess cumulative impacts and trade-offs across 4 hydropower development scenarios.

Scenario	Annual Generation (in GWh)	Annual Generation, cumulative (GWh)	% of Baseline Generation	% of Baseline Generation (cumulative)
Scenario 0	6,444	6,444	100	100
Scenario 1	10,090	16,534	157	257
Scenario 2	6,070	22,604	94	351
Scenario 3	16,840	39,444	261	612

VEC Selection

- Potential VECs were identified from several sources: :
  - Phase 1 work, presented in the Basin Report
  - Discussions and working groups during the Phase 1 workshop
  - The client (DHPS) list of 24 proposed VECs following this workshop
- VECs were grouped under the general categories of environmental, social and economic, to ensure a spread of VECs across these categories and to illustrate trade-offs.
- Criteria influencing consideration of potential VECs in this study included:
  - Highly valued
  - High potential for cumulative impacts
  - Relatively easy to measure
  - Likely to show a difference between scenarios
  - Acceptable quality data
  - Has aspects with legal or policy importance

Selected Environmental VECs

- Forest Cover
- Slope Stability
- Migratory Fish
- Scenery and Landscapes
- Protected Areas

Selected Social VECs

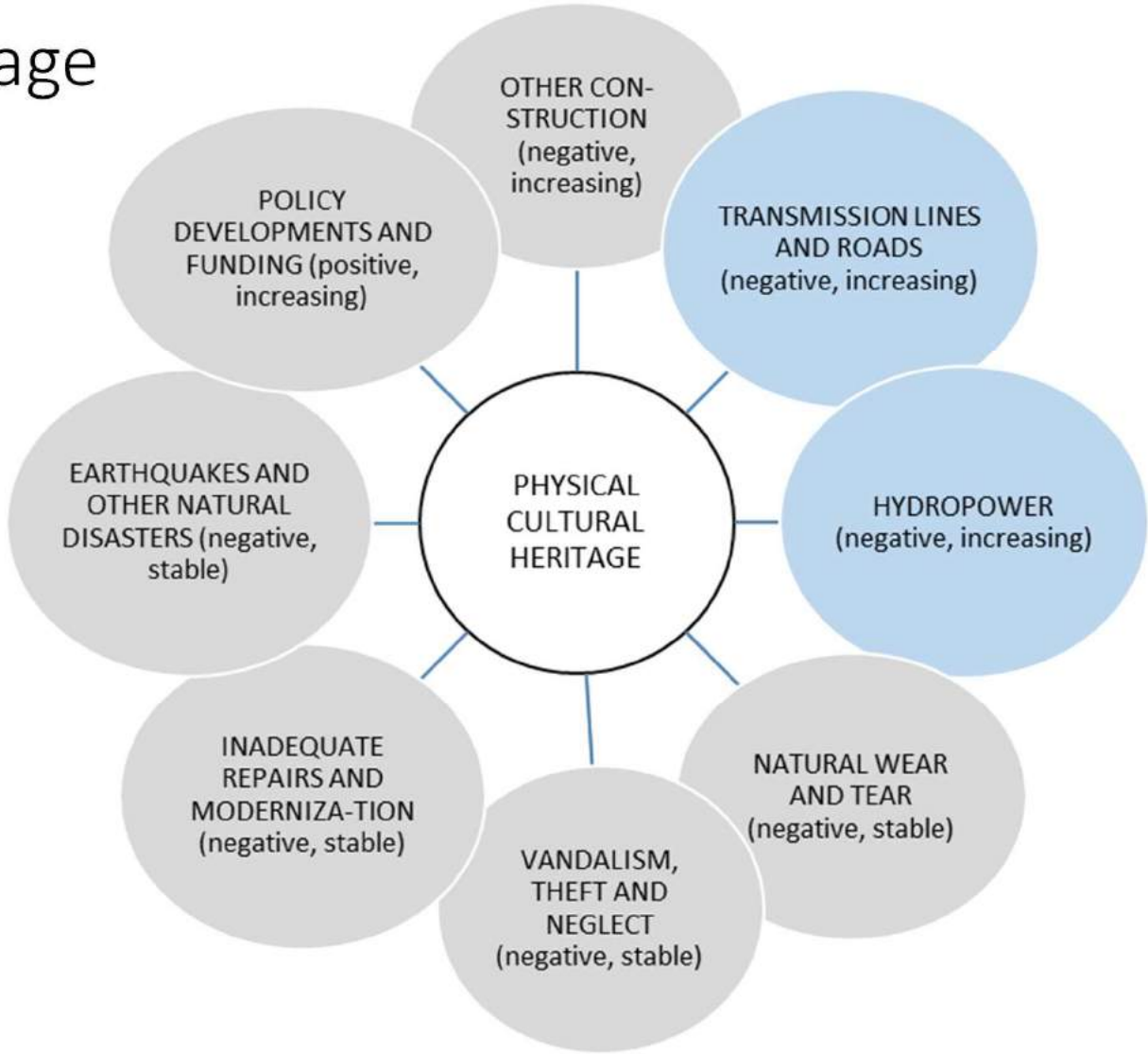
- Livelihood Opportunities
- Community Quality of Life
- Access to Markets and Services
- Cultural Heritage
- Downstream Public Safety

Selected Economic VECs

- Economic Growth
- Domestic Electricity Supply Security

Example VEC Analysis: Physical Cultural Heritage

- A first step for each VEC was to map the various factors affecting that VEC.
- Then for each factor, it was evaluated to discern:
    1. the nature of the influence on the VEC (positive or negative), and
    2. the direction of any trends looking forward (stable, increasing, decreasing)

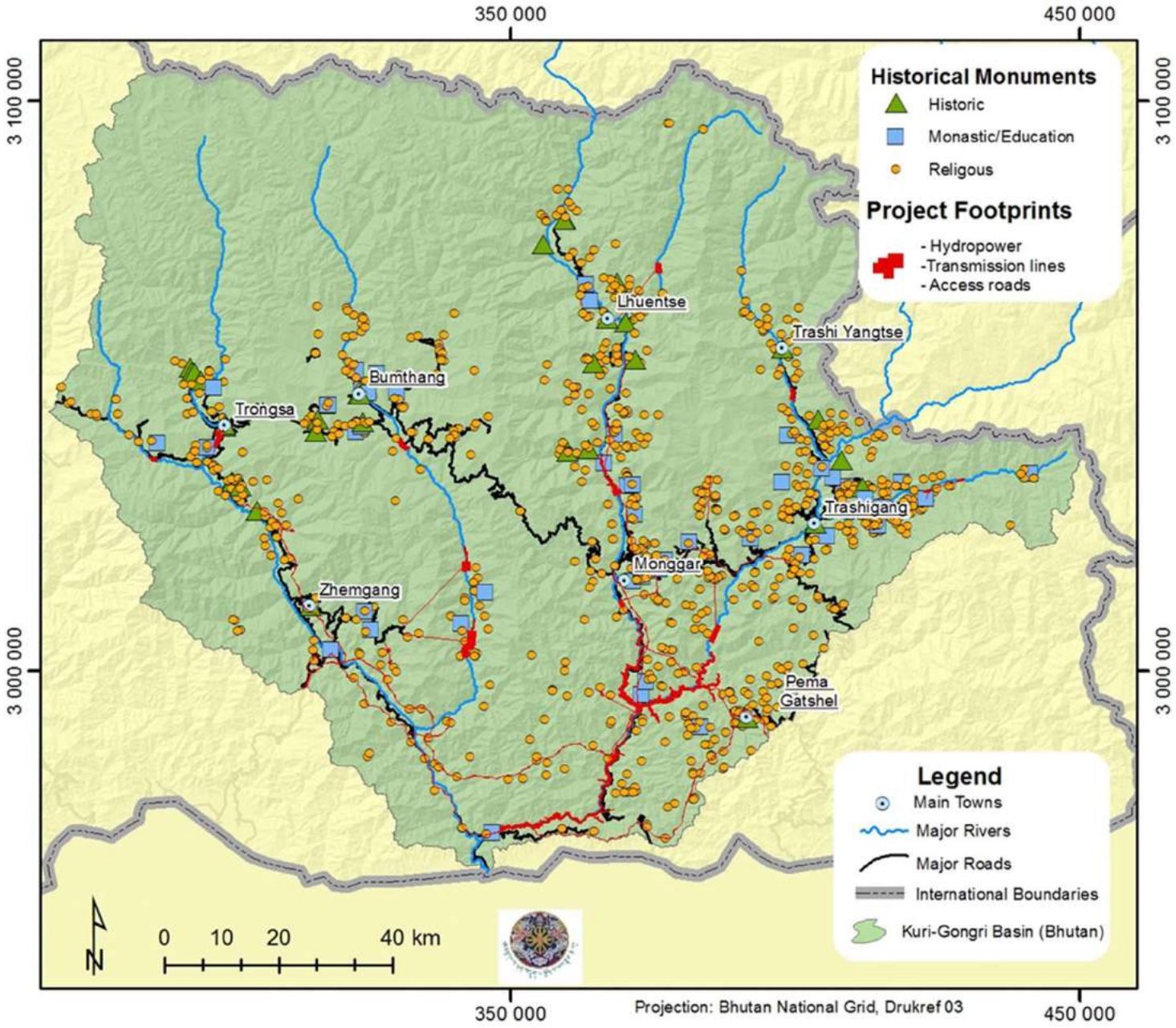


Cultural Heritage VEC –

Indicators:

- Geographical proximity of a heritage building to the project footprint

- Heritage value of the site affected



Cultural Heritage VEC – Impact Ratings

- **A1 Importance:** 0 – No impact on any building; 2 – Lower-value building(s); 4 – Higher-value building(s)
- **A2 Magnitude:** 0 – No impact on any building; -1 – Minor change, between 1 and 10 sites are impacted; -2 – Significant change, between 11 and 20 sites impacted; -3 – Very significant change, more than 20 sites and/or any high-value sites impacted.
- **B1: Permanence:** All impacts within the area covered by project infrastructure and 500 meter buffer zones were considered to be of a mainly permanent nature, and were assigned a rating of 3 (permanent).
- **B2: Reversibility:** High value sites = 3 (Not easily mitigated); Lower value sites = 2 (Easily mitigated or reversed, through good management practices)
- **B3: Synergism** was rated at 1 (no changes or antagonistic)

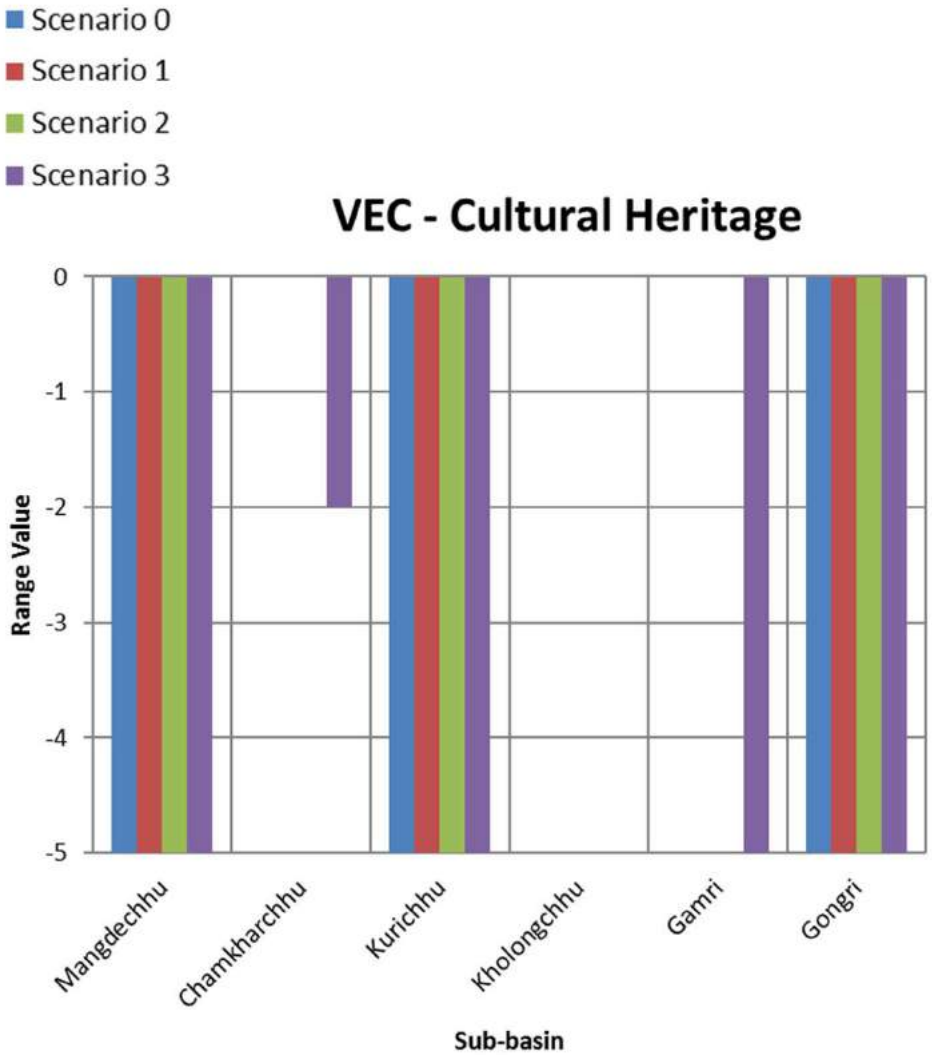
CIAM Scores

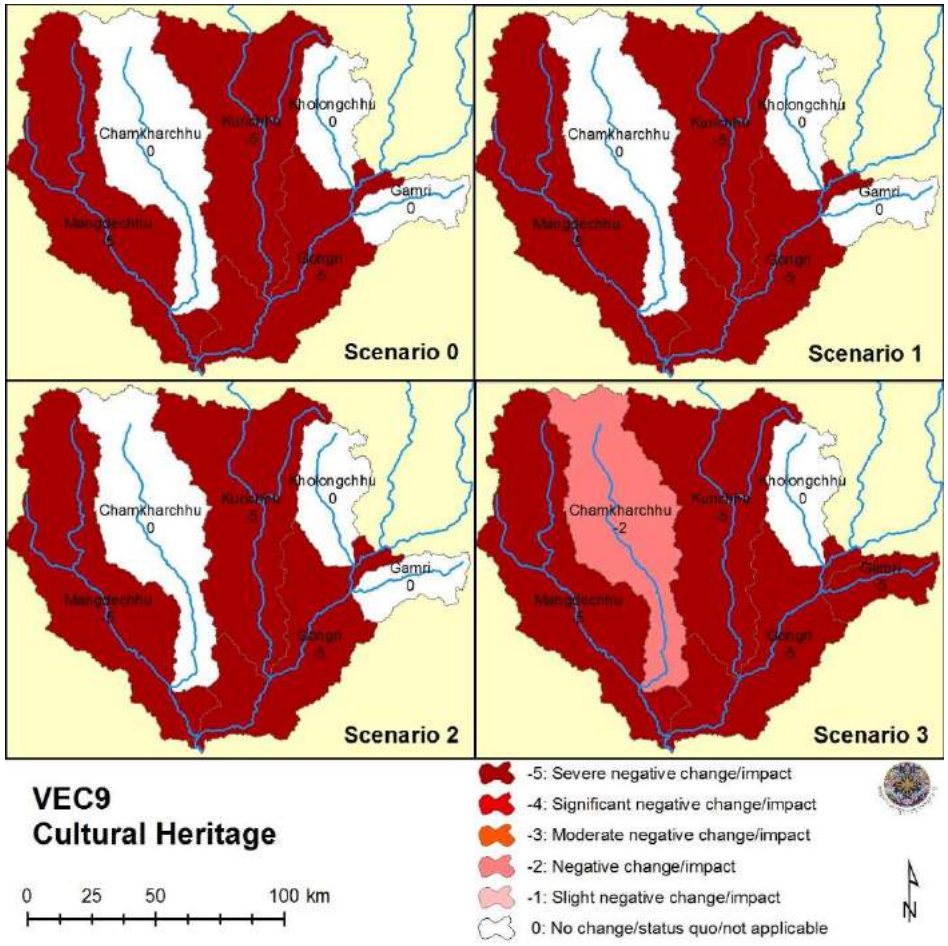
Scenario 0 – Cultural Heritage

Range	0-4	-3 - +3		1-3	1-3	1-3			
	Group A			**Group B**					
Sub-basin	**A1**	**A2**	**aT**	**B1**	**B2**	**B3**	**bT**	**ES**	**RV**
Mangdechhu	4	-3	-12	3	3	1	7	-84	-5
Chamkharchhu	2	0	0	3	0	1	4	0	0
Kurichhu	4	-3	-12	3	3	1	7	-84	-5
Kholongchhu	0	0	0	3	0	1	4	0	0
Gamri	4	0	0	3	3	1	4	0	0
Gongri	4	-3	-12	3	3	1	7	-84	-5

Evaluation Scores	RV	Description of range band
72 to 108	5	Major pos. change
36 to 71	4	Significant pos. change
19 to 35	3	Moderate pos. change
10 to 18	2	Pos. change
1 to 9	1	Slight pos. change
0	0	No change
-1 to -9	-1	Slight neg. change
-10 to -18	-2	Neg. change
-19 to -35	-3	Moderate neg. change
-36 to -71	-4	Significant neg. change
-72 to -108	-5	Severe neg. change

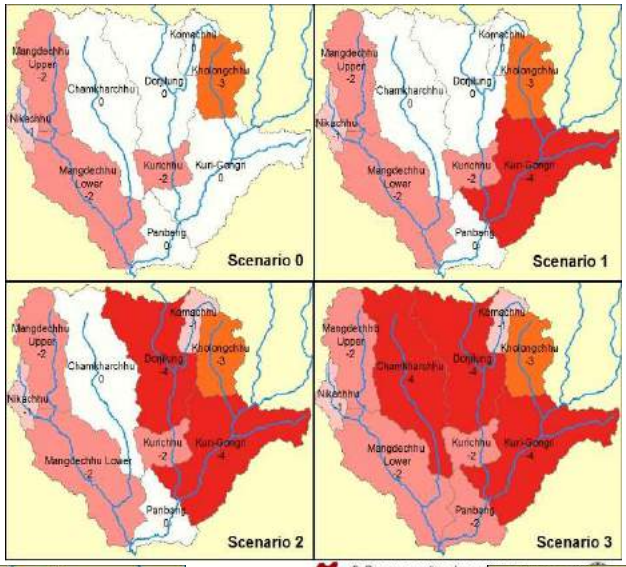
Interpretation and Presentation of Results



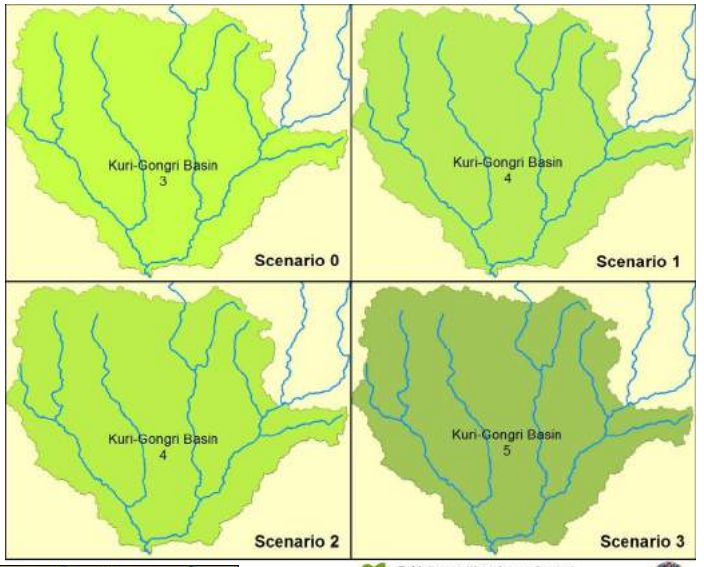


Some Other VEC Results

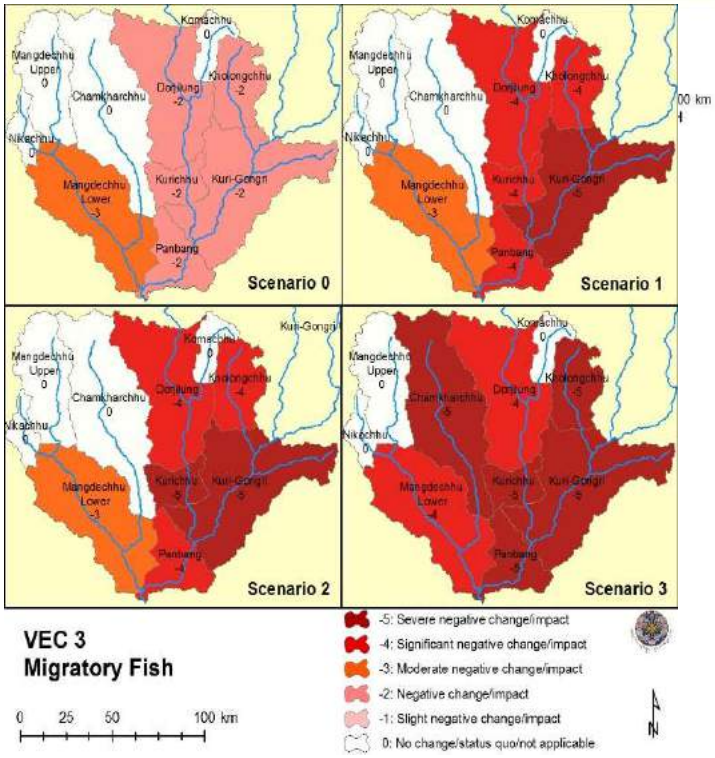
Slope Stability



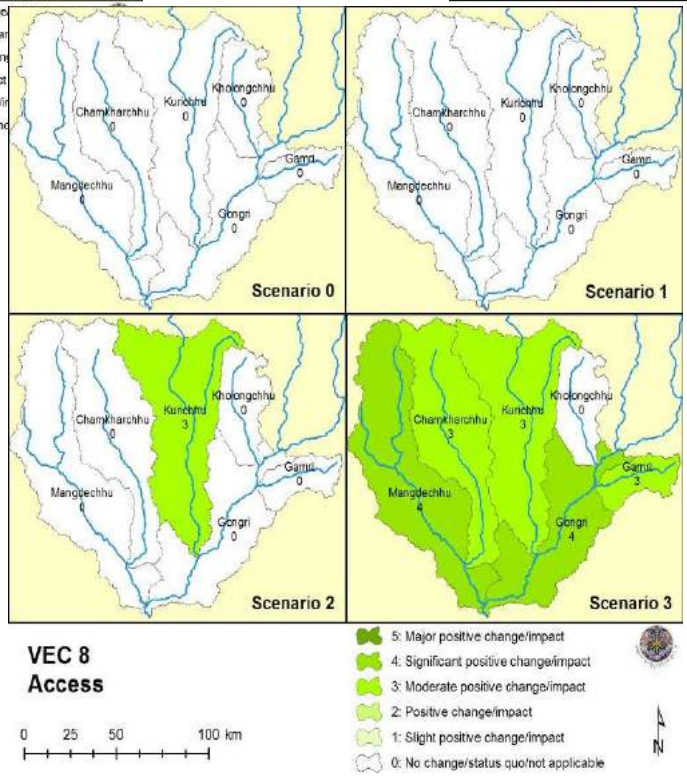
Economic Growth



Migratory Fish

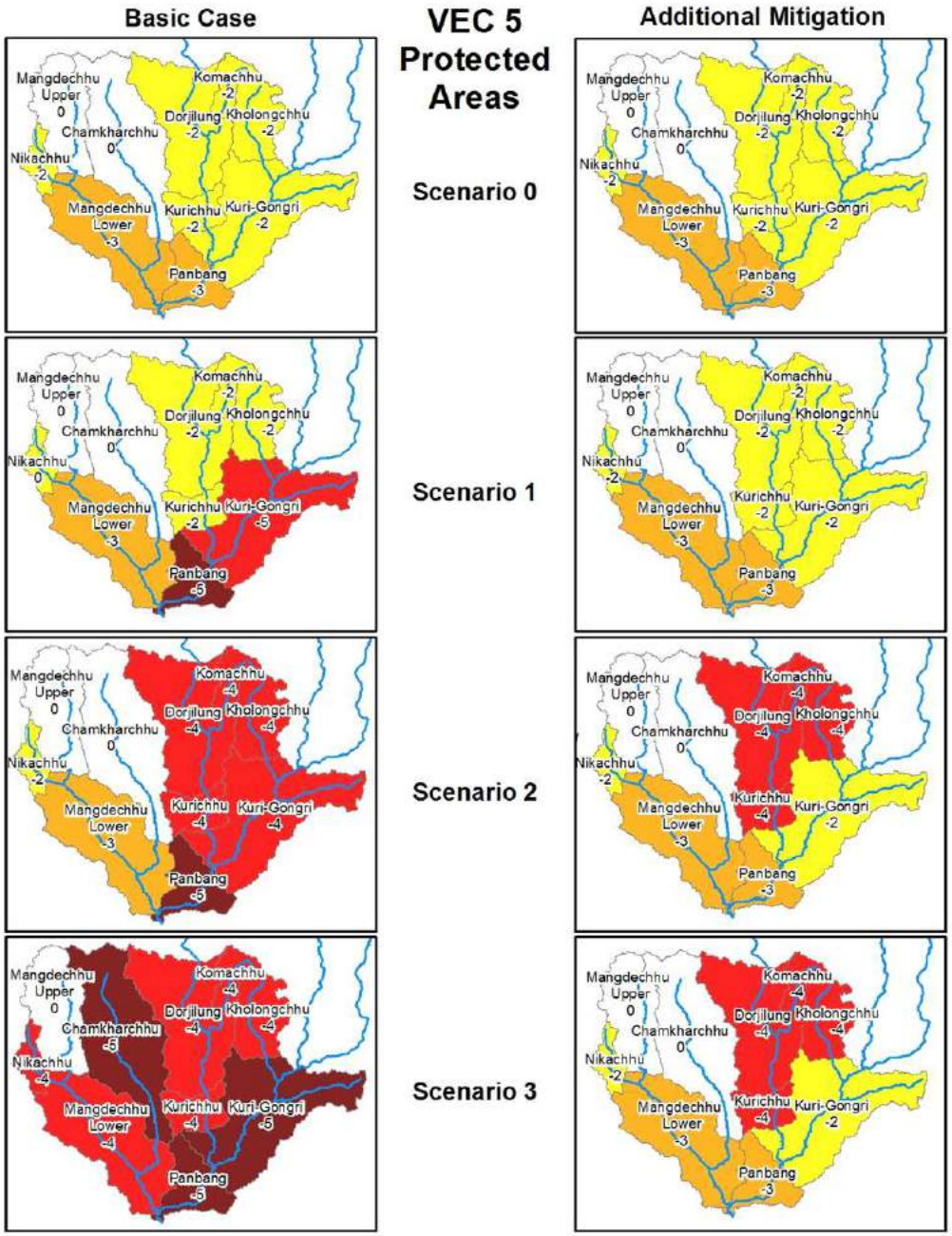


Access to Markets and Services



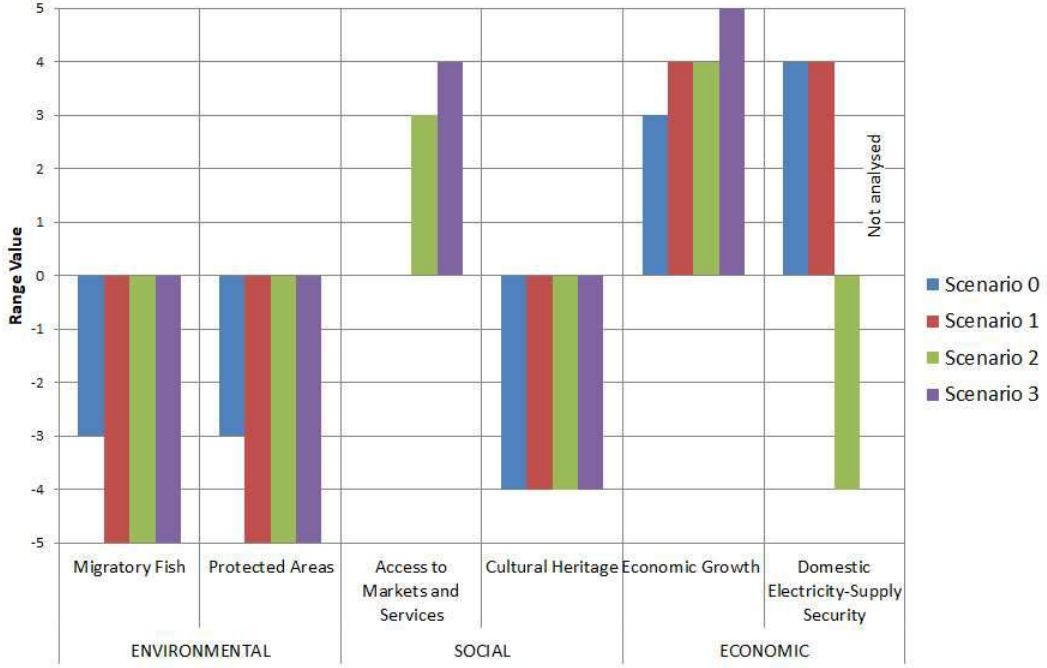
Analysis of Mitigation – Example of the Protected Areas VEC

- Mitigation measures for protected areas included:
  - protection of core zones and species of conservation concern
  - preservation of the Chamkharchhu River as a wild river
  - operation of the Kuri-Gongri and Panbang projects as a combined run-of-river operation
- Application of these measures could show a distinct lessening of impacts in some scenarios and sub-basins.

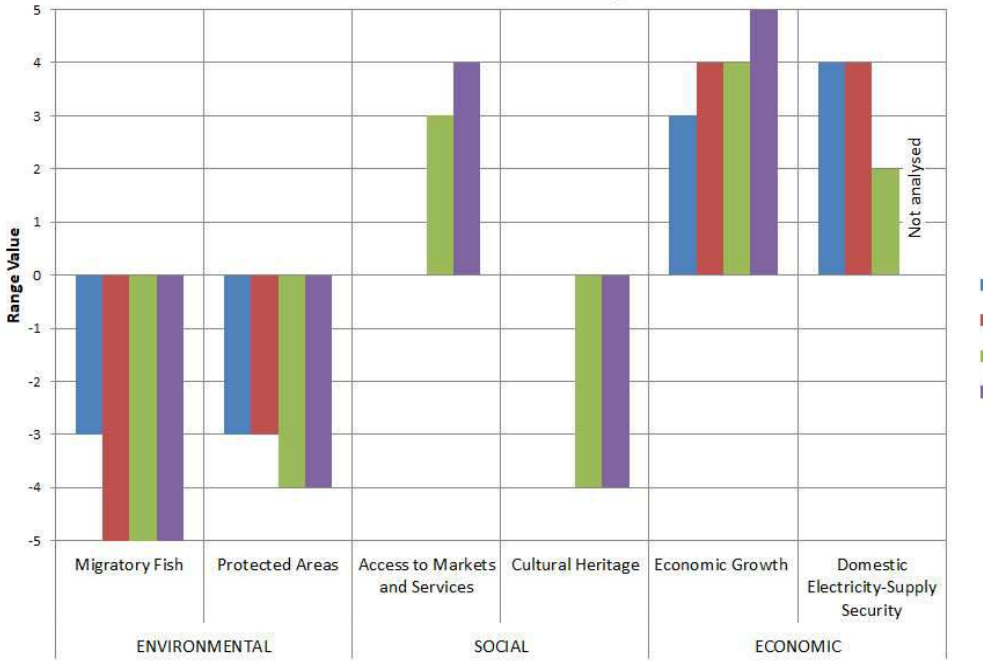


Kuri-Gongri CIA – Overall CIAM Results for Six Selected VECs

Overall CIAM Results for 6 Selected VECs, by Scenario



Comparison of Results with Additional Mitigation Measures



Main Messages from the Kuri-Gongri CIA Study

- There is potential to reconsider some of the hydropower projects and scenarios to formulate a lower impact hydropower development programme for the basin.
- Effective implementation of the national Guidelines for the Development of Hydropower Projects is essential.
- The distribution of impacts (primarily local) and benefits (primarily national) will require particular attention.
- Important adjustments which could contribute to reduced negative impacts to the aquatic environment in the medium to long term include to:
    - leave the Chamkharchhu River intact, with no hydropower development;
    - prioritize projects above 1,000 m.a.s.l. that would have considerably less impact on fish migration;
    - operate all projects (or tandem projects as below) in run-of-river mode and avoiding unmitigated peaking operations, if economically feasible;
    - develop the Kuri-Gongri and Panbang projects in tandem, with Panbang acting as a re-regulation storage to mitigate downstream impacts from peaking; and
    - develop cost-effective and efficient fish passage solutions.

QUESTIONS AND DISCUSSION ABOUT CIA AND CIAM

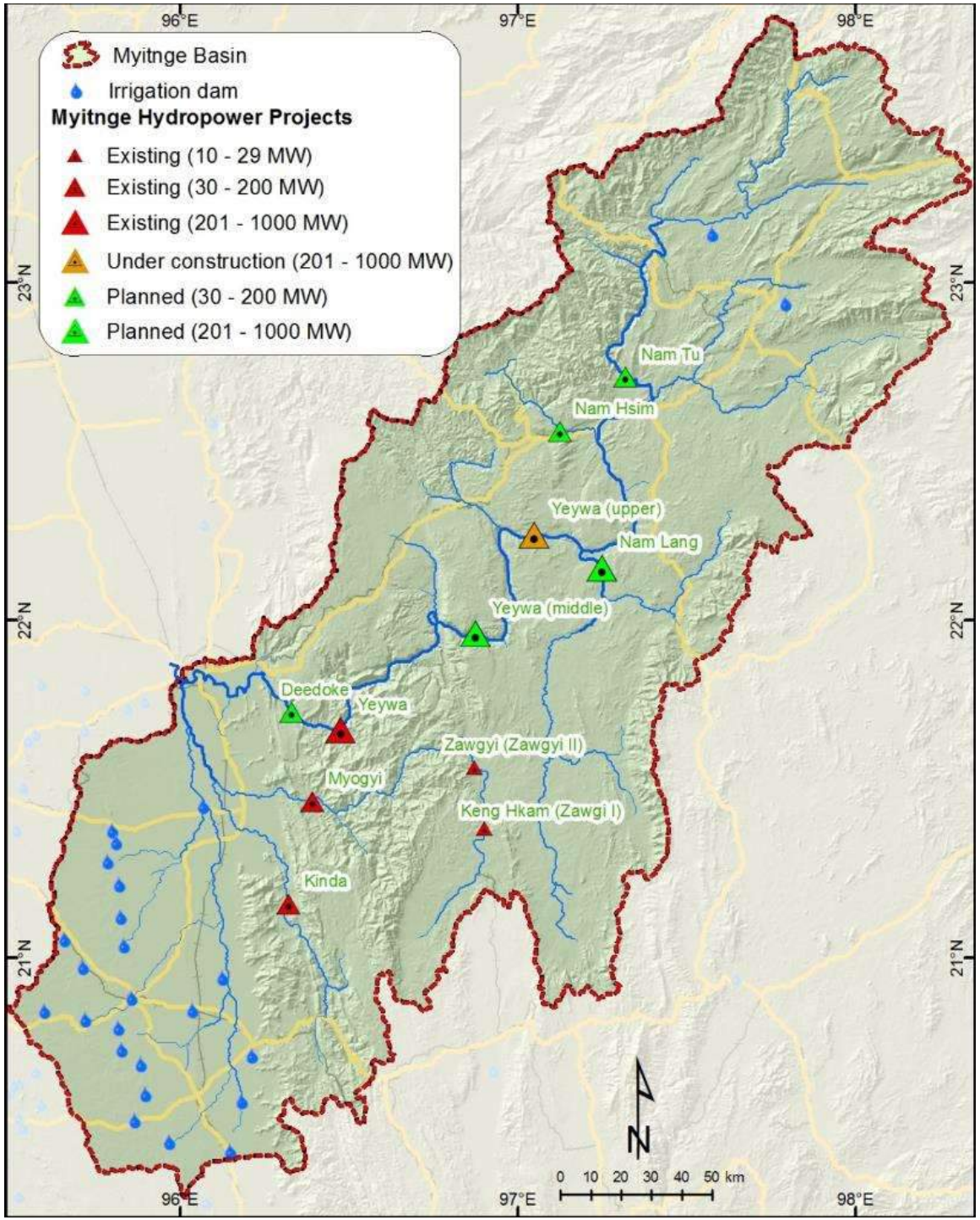
LUNCH

LUNCH

MYITNGE RIVER BASIN – STATE OF KNOWLEDGE AND AVAILABLE INFORMATION

River network and water use

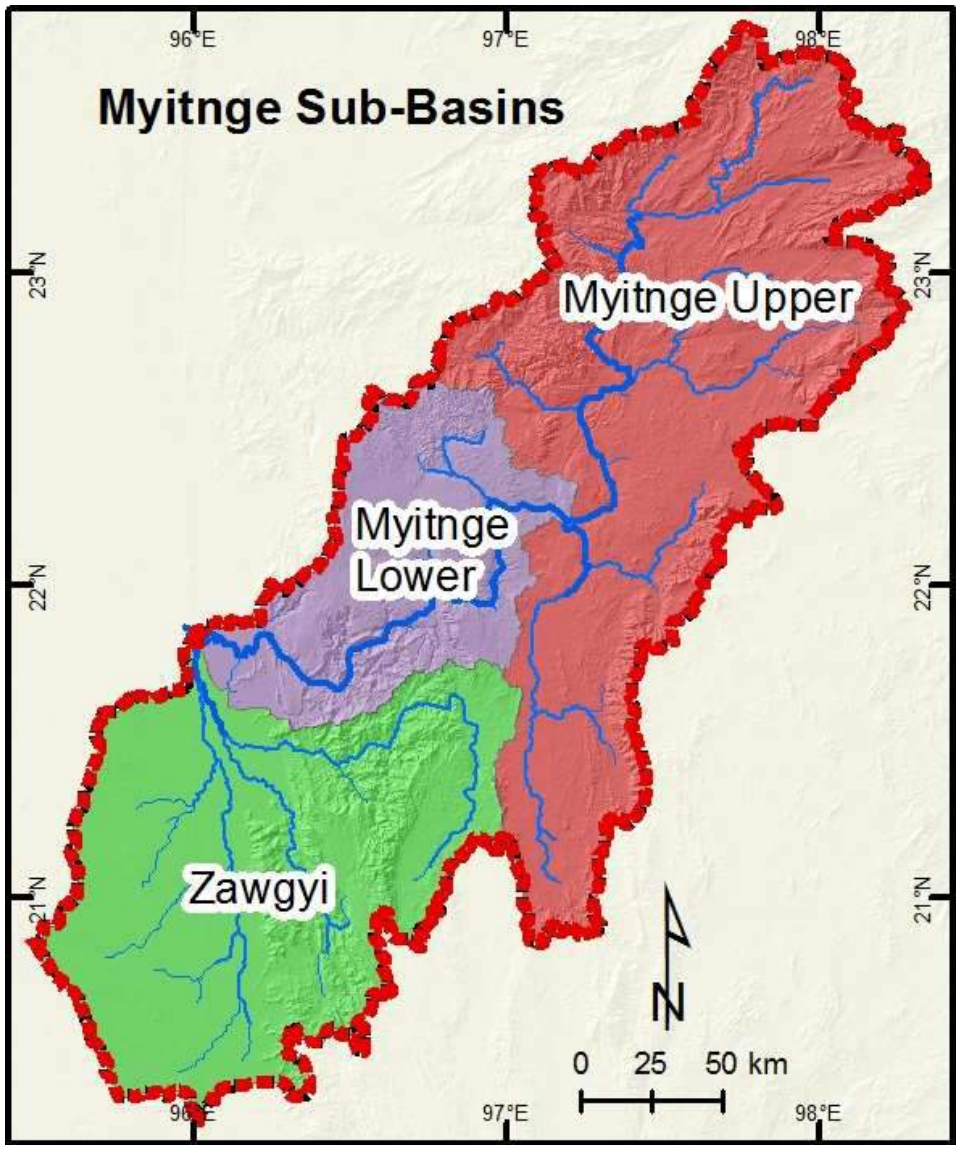
- The Myitnge main river is developing a hydropower cascade
- The Zawgyi sub-basin has its main focus on irrigation – but also hydropower generation



River network and water use

- The Zawgyi river joins the Myitnge near the confluence with the Ayeyarwady
- The Zawgyi outflow will have limited backwater effect on the Myitnge and negligible effect on HPPs in the Myitnge

- The Myitnge (excluding the Zawgyi) and the Zawgyi can be analyzed separately in terms of water issues.



Hydrology Figures

- The Myitnge contributes 7% to the Ayeyarwady flow
- Total storage is 6600 Mm^3 – which is relatively small
- In the Zawgyi 15% of the flow is abstracted – in the Myitnge sub-basin only 2%

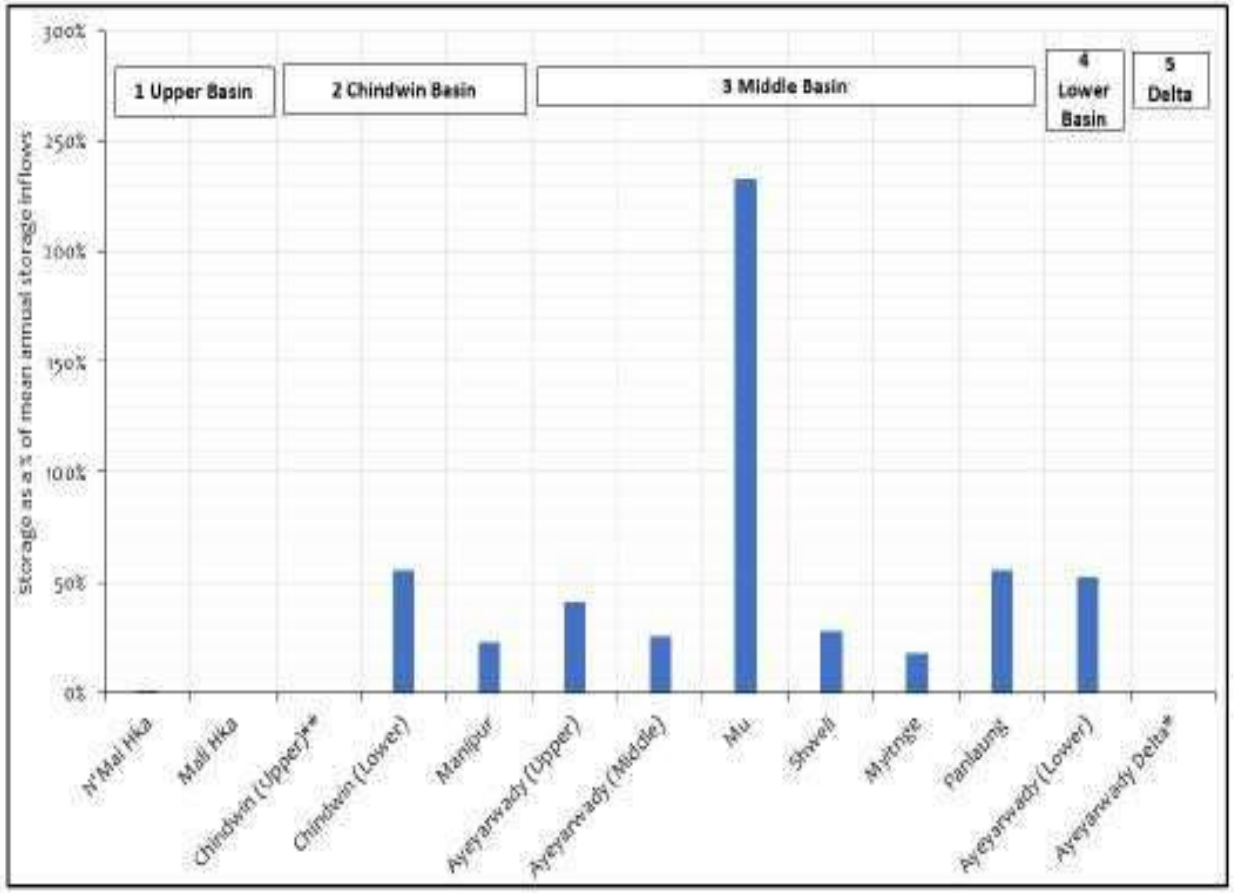
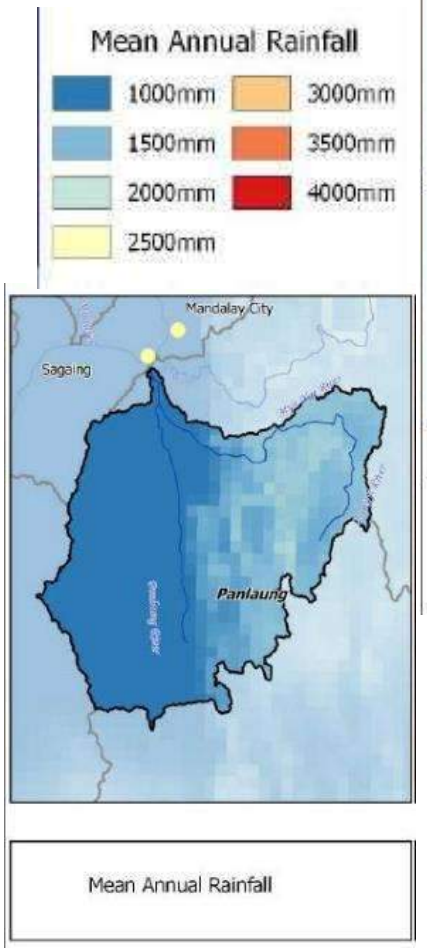
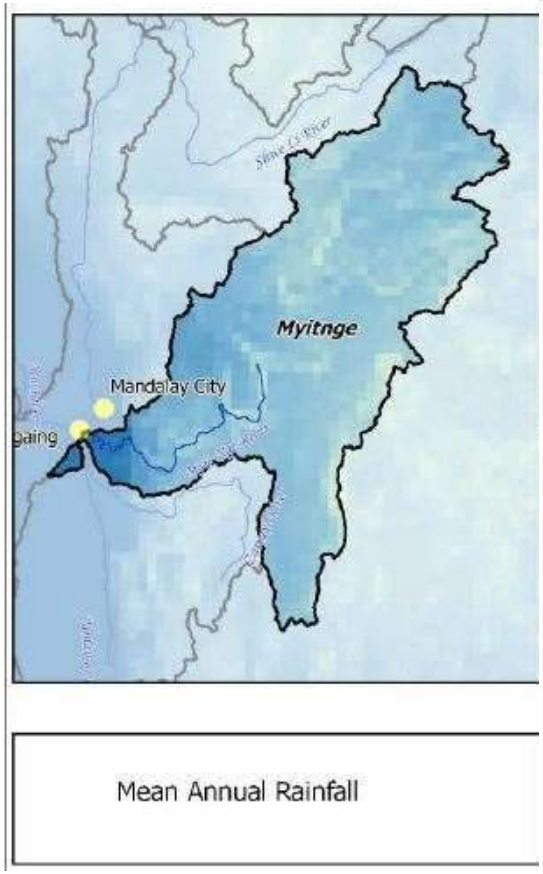


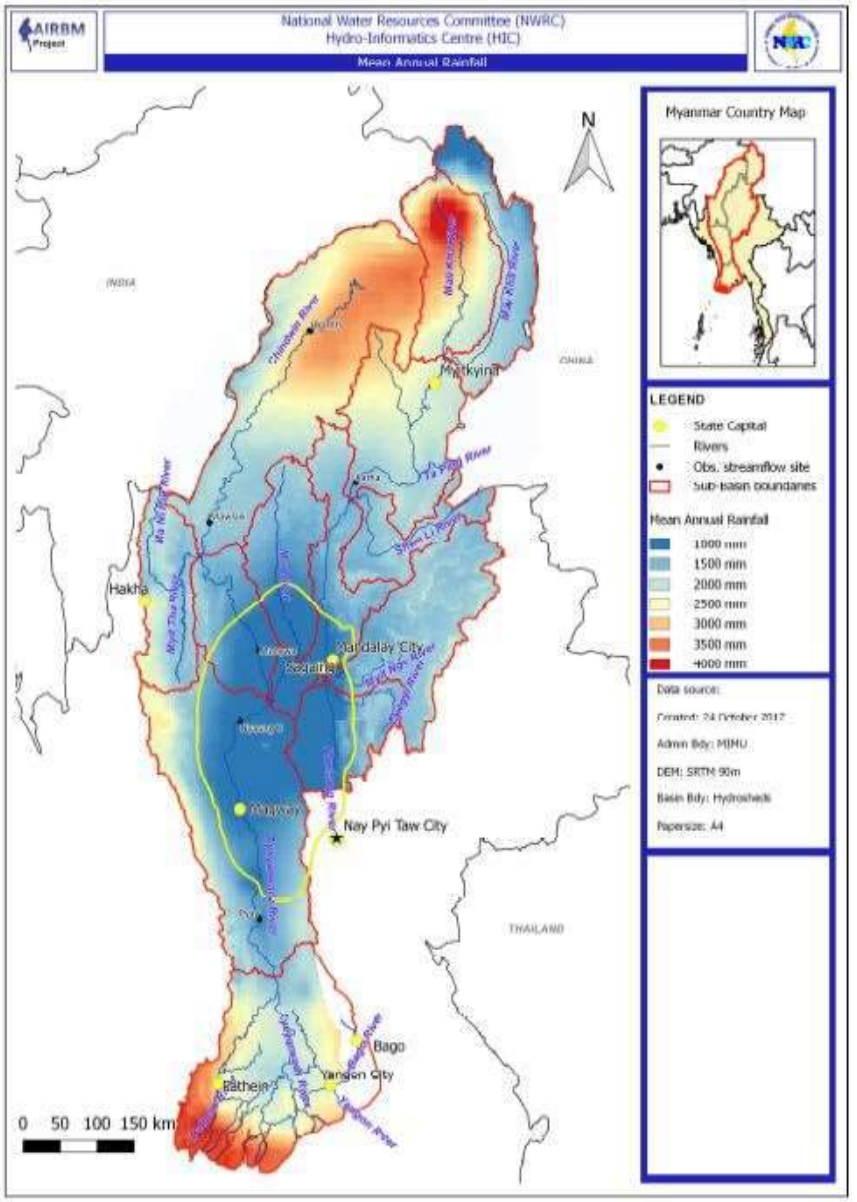
Figure 52 Storage volume as a % of average annual sub-basin runoff

Source: Ayeyarwady State of the Basin Assessment (SOBA), Surface Water Assessment, Vol. 1.2, 2018

Rainfall

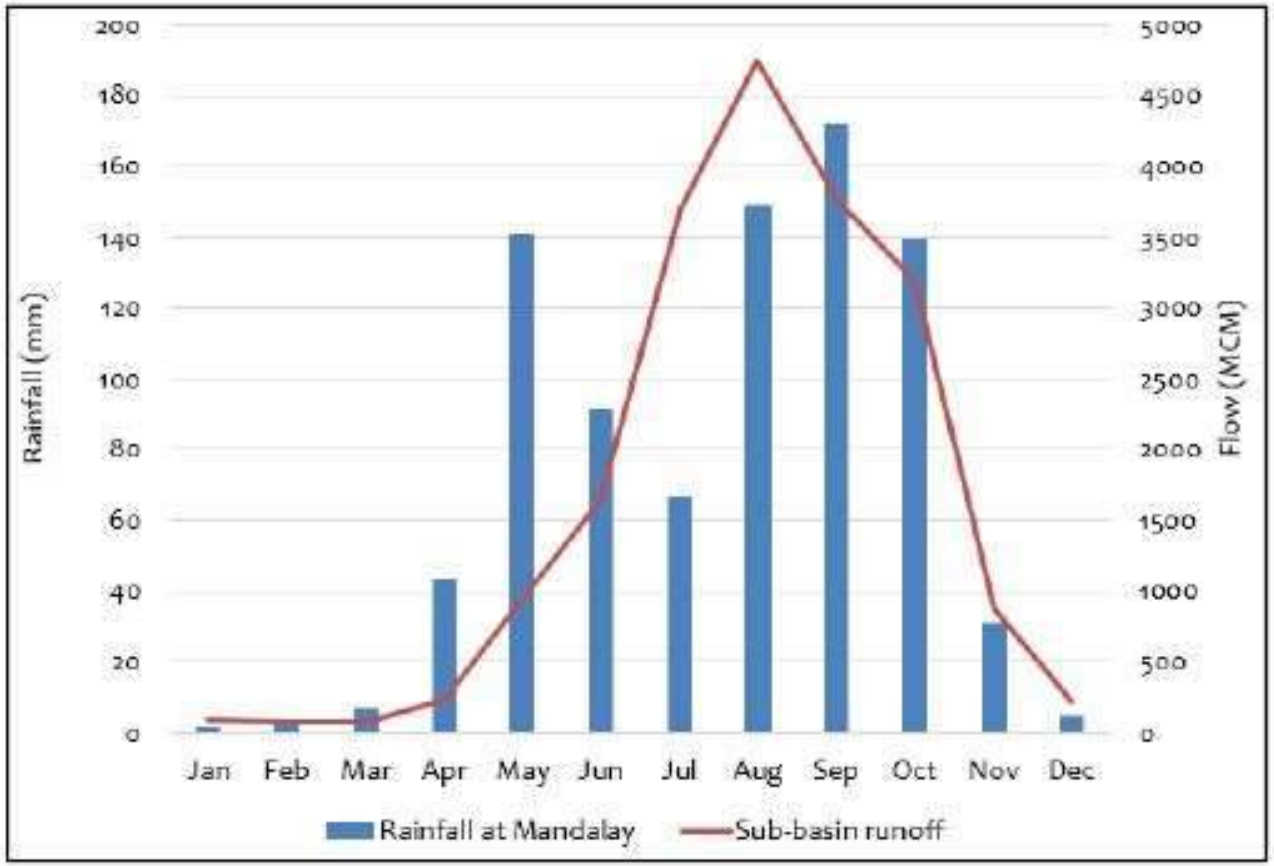




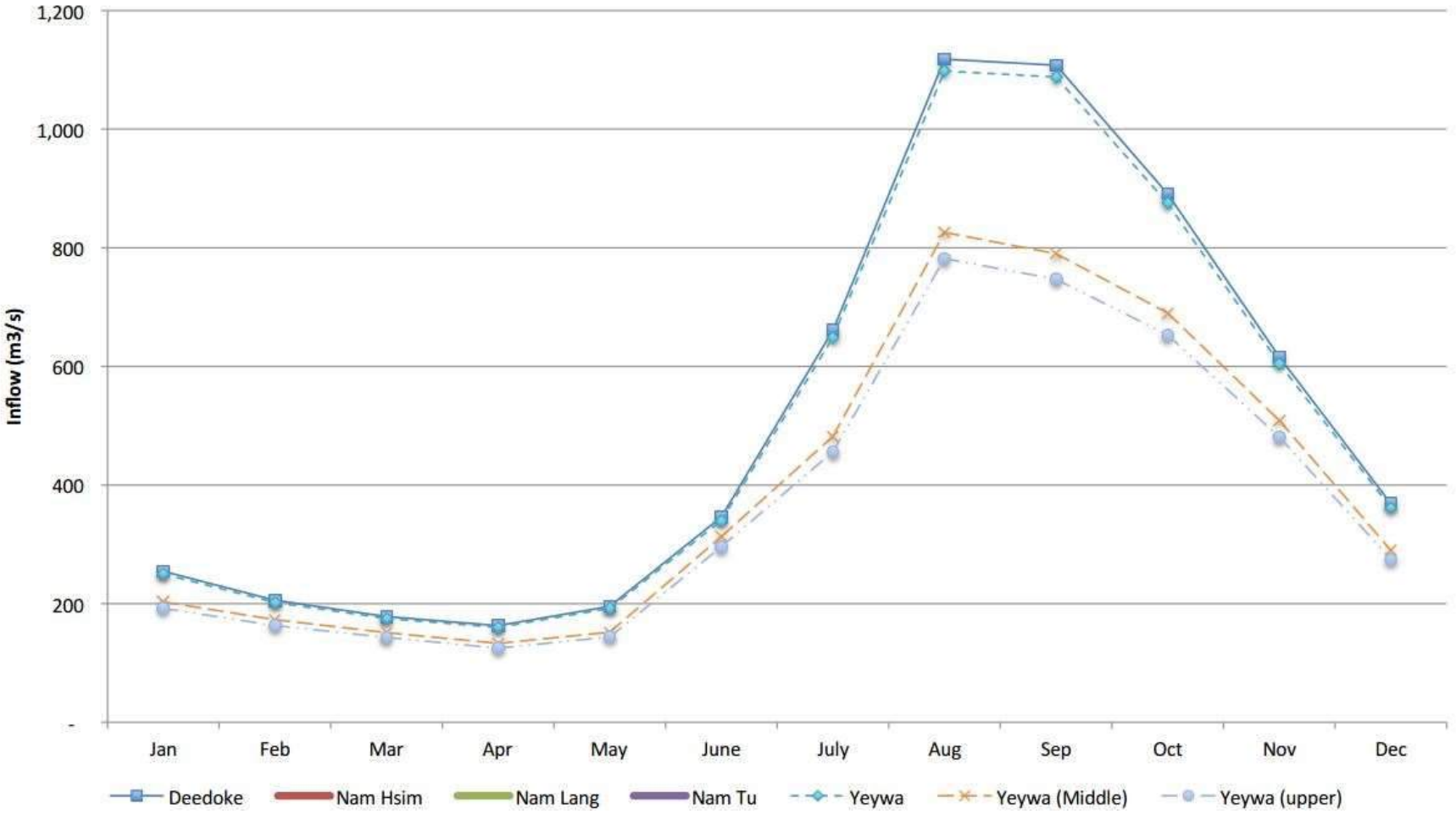


Source: Ayeyarwady State of the Basin Assessment (SOBA), Surface Water Assessment, Vol. 1.2, 2018

Rainfall Distribution and Hydrograph



Dam Inflow Hydrographs



Hydrologic Data Availability

- Data are generally limited
- Flow records at the dams
- Few water level records available
- Rainfall data is limited – if available at all in the basin

- Rainfall from satellite data is an option
- Hydrologic modelling as a tool simulating design data
- More data for model calibration needed

Background to Energy Developments – National Perspective

- The National Electricity Masterplan Plan has a target that 100% of the country is to be electrified by 2030 (from 38% in 2017).
- High economic growth requires electric energy generation and distribution developments (6.4% growth in 2018, and 6.8% expected for 2019).
- The installed capacity of hydropower and renewable energy in 2030 is expected to be approximately 40% and 10% of total capacity, perspectively.
- Myanmar has a high hydropower and solar power potential.

Facts about Power in Myanmar

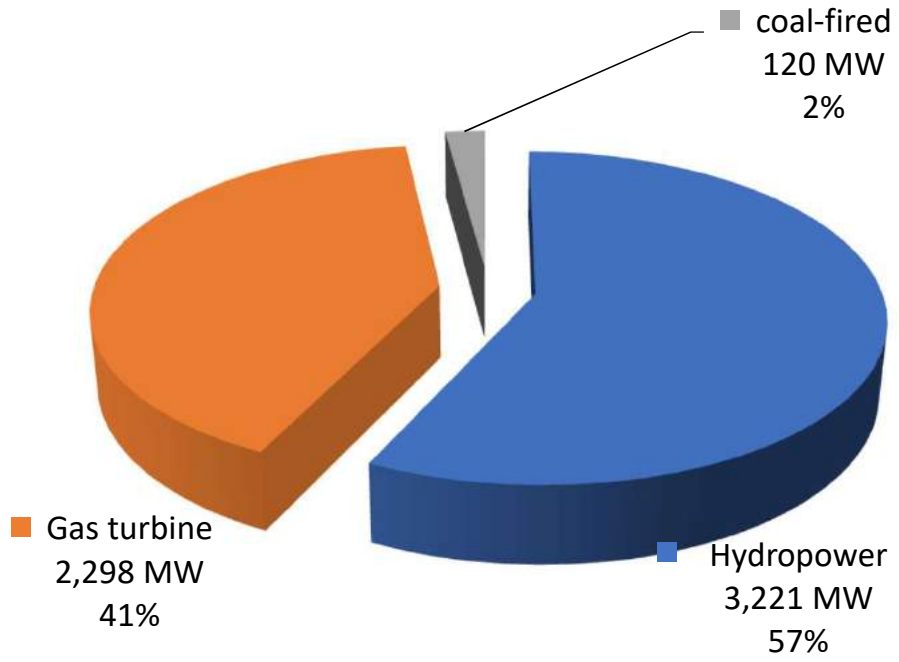
Period 2012-2017:

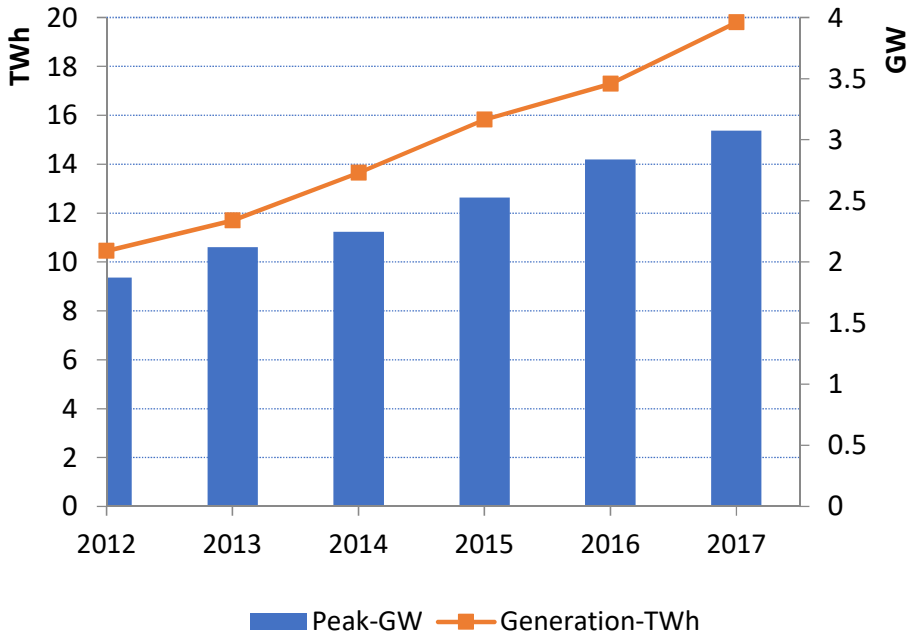
- Average annual power generation growth is 13.6%
- Annual power installed capacity growth is 9.7%

Installed capacity in 2017:

- On grid: 5,639 MW
- Off-Grid: 134.3 MW

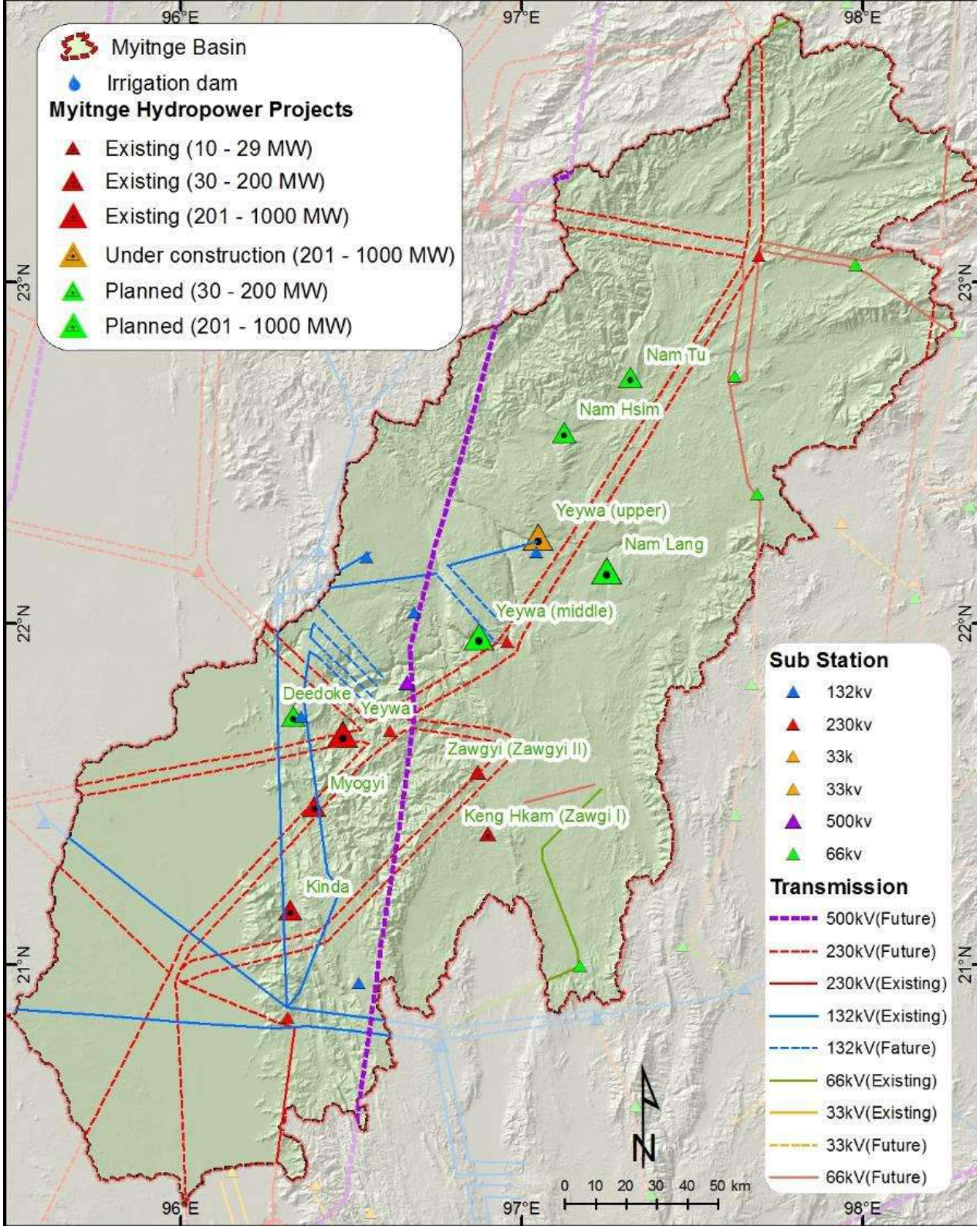
On Grid Power Sources in 2017





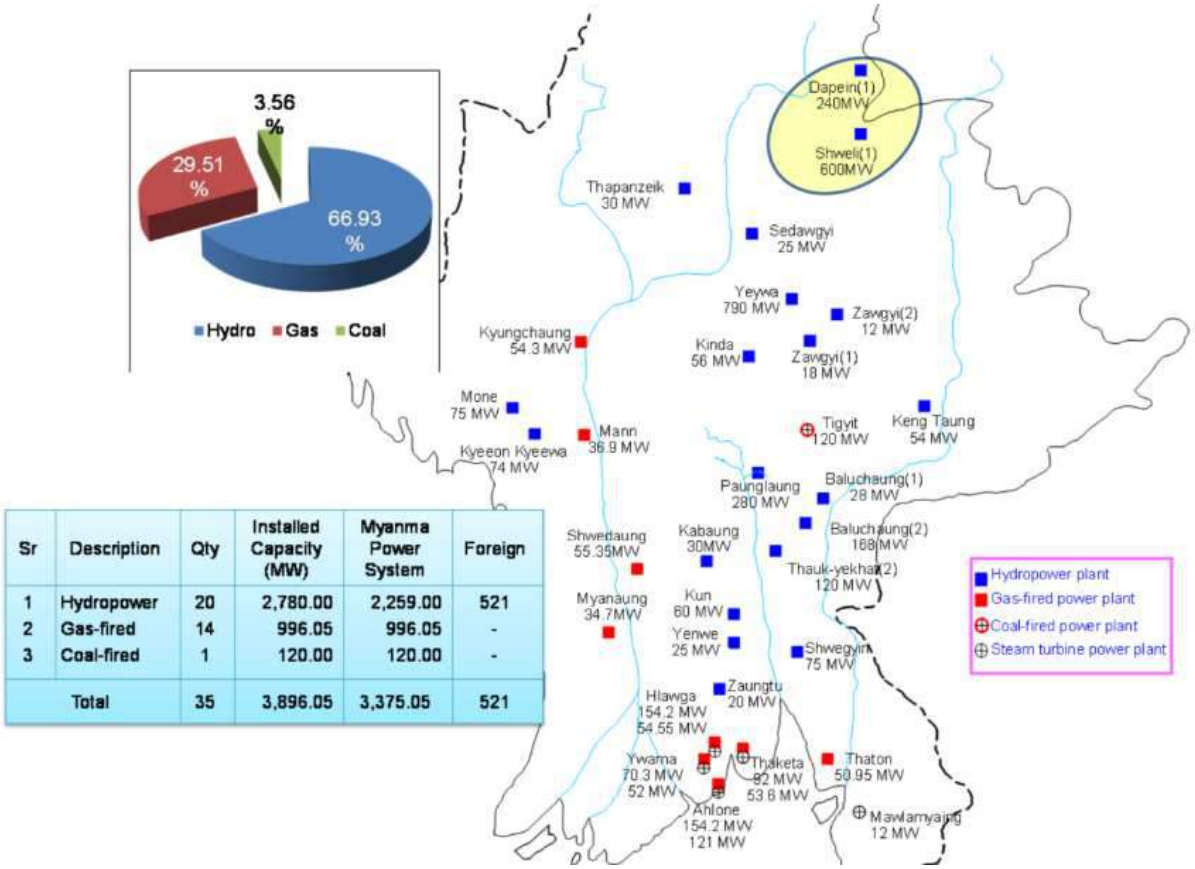
Transmission in Myanmar

- Electricity demand is concentrated in southern Myanmar
- Yangon City accounts for ~ 50% and Mandalay division accounts for ~ 25% of the national electricity demand.
- The 230 kV transmission network has been developed mainly in the North - South direction
- The power transmission network has recently developed slowly.
- The North-South power transmission usual congests in rainy season
- Power transmission has high losses ~ 7%



Power Development Challenges in Myanmar

- Electricity demand is expected to increase rapidly.
- The electrification rate is low compared to some countries in the region.
- Power plants need to develop faster to meet power demand growth.
- The power grid needs to be upgraded and added to, in order to:
  - Address congestion in the rainy season due to inadequate capacity; and
  - Reduce transmission and distribution power losses.
- Plans need to integrate environmental and social issues management and mitigation

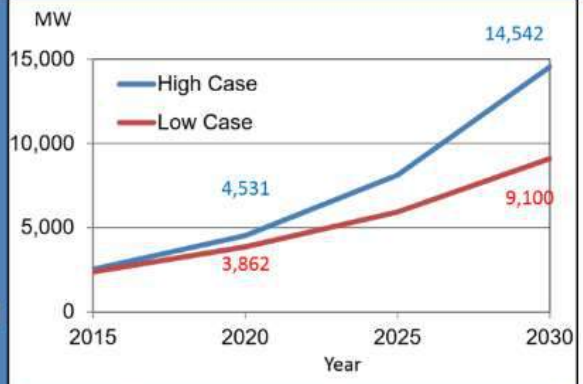
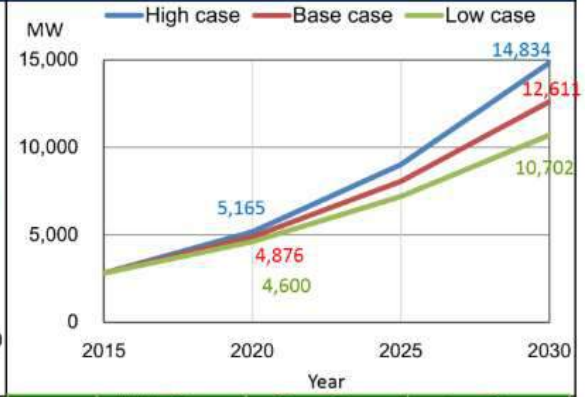


Sr	Description	Qty	Installed Capacity (MW)	Myanma Power System	Foreign
1	Hydropower	20	2,780.00	2,259.00	521
2	Gas-fired	14	996.05	996.05	-
3	Coal-fired	1	120.00	120.00	-
Total		35	3,896.05	3,375.05	521

Myanmar National Electricity Master Plan (NEMP)

- The 2014 NEMP aimed for 50% of the country to be electrified in 2020, 75% in 2025, and 100% in 2030.
- Two cases were defined for the power source planning program:
  1. ***High Case***: 4,531 MW by 2020; 14,542 MW by 2030; average annual growth – 13%
  2. ***Low Case***: 3,862 MW by 2020; 9,100 MW by 2030; average annual growth – 10%

- As of August 2016, MOEE has updated the NEMP2014 in collaboration with JICA experts.
- A new Base Case is proposed:
  - 4,876 MW by 2020
  - 12,611 MW by 2030

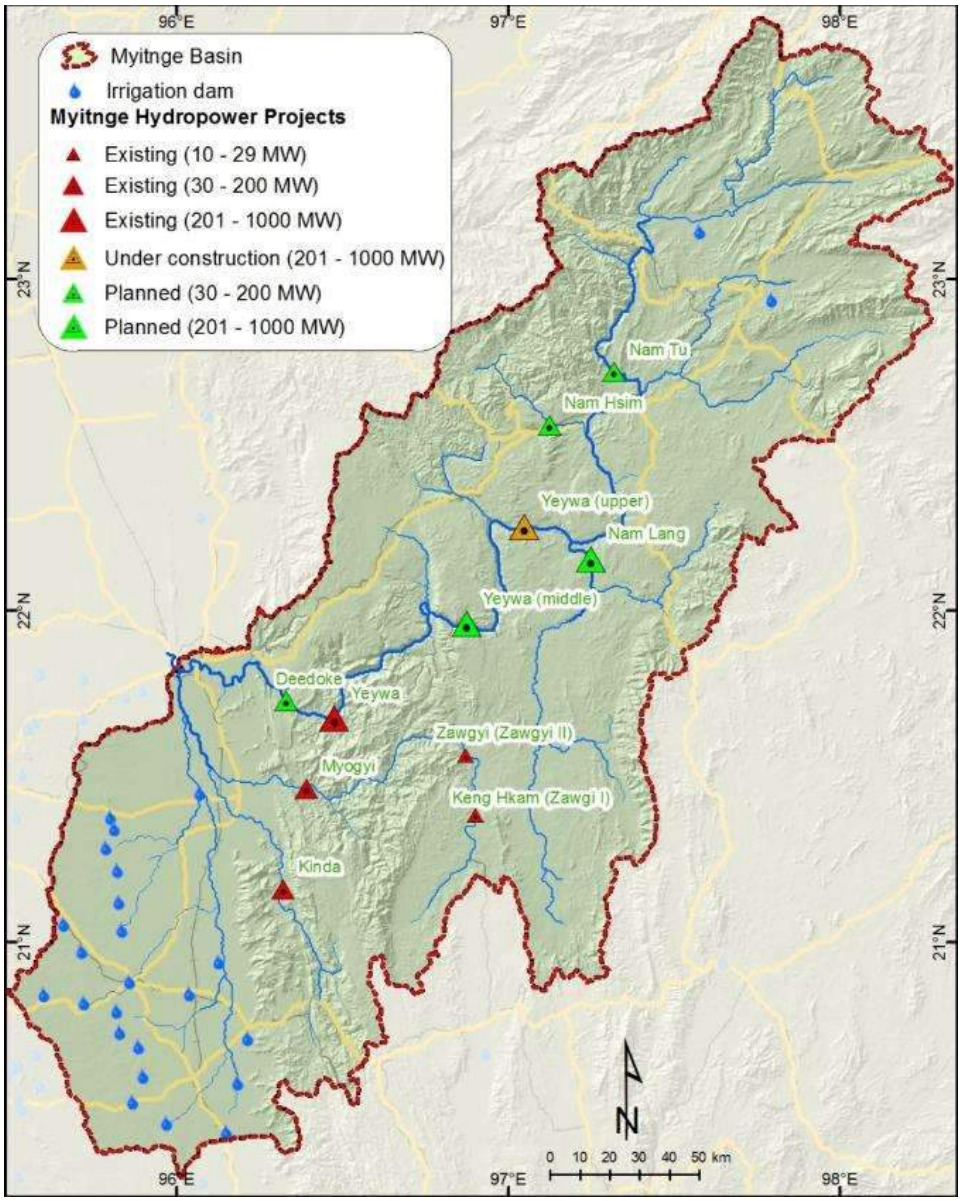
Item	Original	Revision
Peak demand		

Year	High Case (MW) Total	Low Case (MW) Total
2012	1,874	1,874
2020	4,531	3,862
2030	14,542	9,100

Year	High Case Total	Base Case Total	Low Case Total
2015	2,800	2,800	2,800
2020	5,165	4,876	4,600
2030	14,834	12,611	10,702

Myitnge River Basin Present and Planned Power Developments

Hydropower Project	Capacity (MW)	Status
Yeywa	790	Existing
Zawgyi I (Keng Hkam)	6	Existing?
Zawgy II (Zawgyi)	12	Existing?
Myogyi	30	Existing
Kinda	56	Existing
Upper Yeywa	280	Under construction
Middle Yeywa	735	Planned
Deedoke	60	Planned
Nam Tu (Hsipaw)	210	Planned
Nam Hsim	30	Planned
Nam Lang	210	Planned



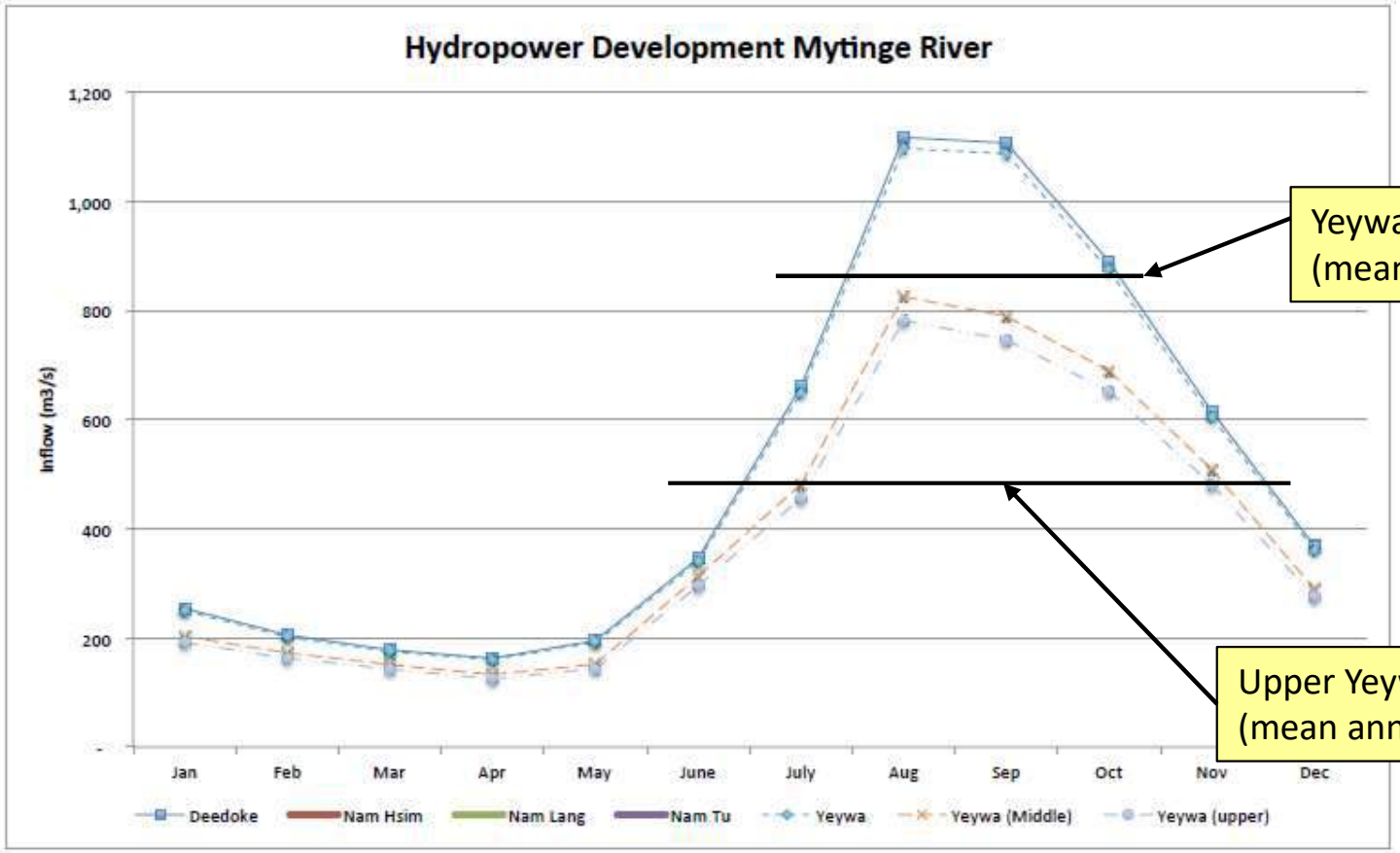
Power Developments in the Myitnge River Basin – In Summary:

- 1 hydropower plant in operation, 1 plant under construction and 5 plants under development in Myitnge catchment.
- 4 hydropower plants in operation in Zawgyi catchment, as part of multi-purpose projects.
- Main data is available for these plants. However, a Hydropower Development Master Plan has not been available.
- Plans for cascade water management and power optimization are unclear.
- Other than several off-grid small hydro linked to industries (e.g. a cement works), further existing or potential renewable power projects are unclear.

Myitnge River Basin – Power Demand

- The national and regional base and peak load demand curves for power generation are unknown. Consequently, water management strategies for generation are unclear for the Myitnge River Basin , both on a daily, weekly and yearly basis.
- It is unknown if the planned hydropower projects will meet the demands for base and peak load.

Myitnge River Basin – Hydrological Difficulties, or Not?



Yeywa, max. turbine flow 840 m^3/s (mean annual flow 483 m^3/s)

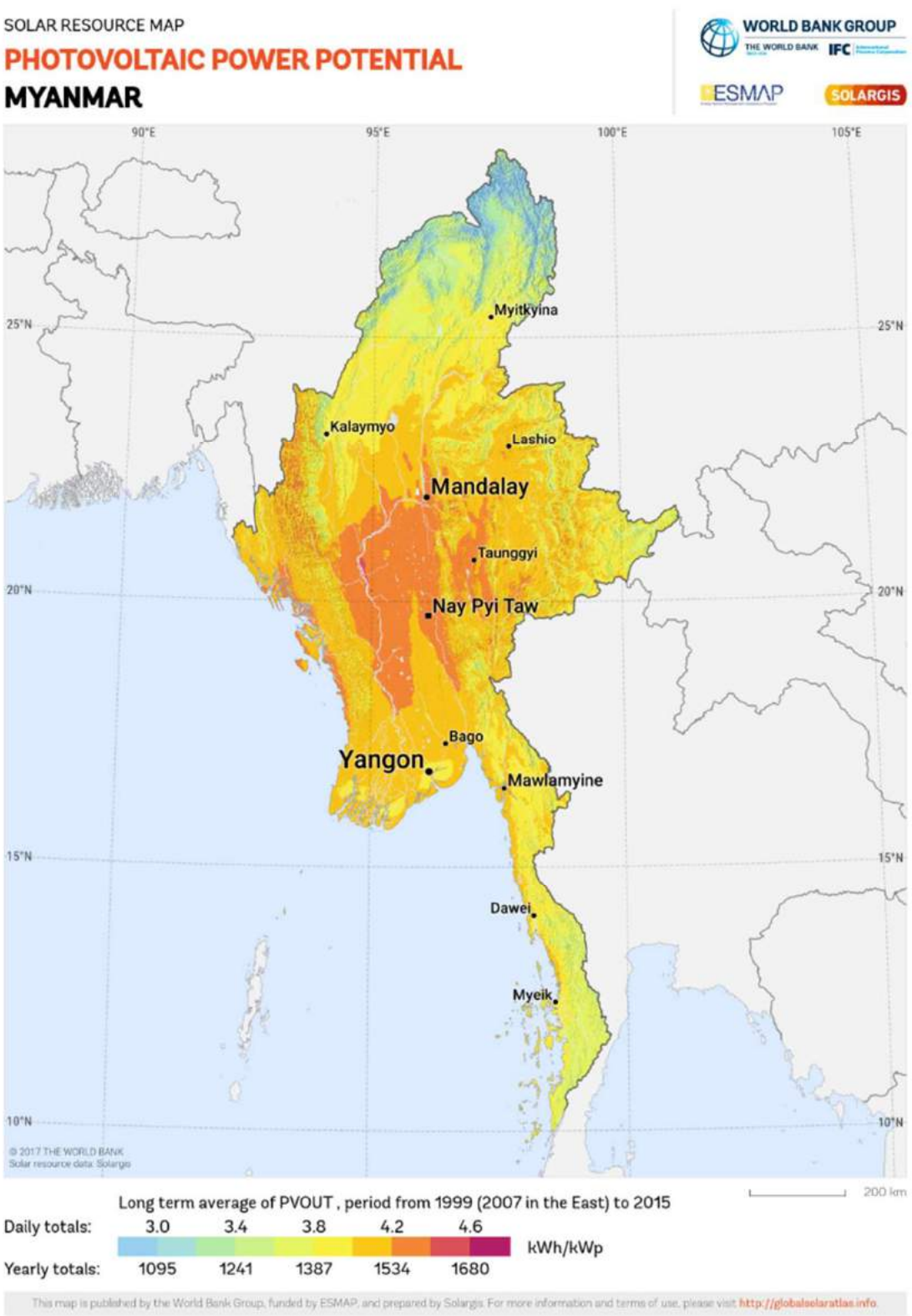
Upper Yeywa, max. turbine flow 473 m^3/s (mean annual flow 371 m^3/s)

Sources of Information about Renewable Energy Projects

- MOEE (EPGE, DHPI, DEPP)
- DRD (especially for off-grid rural electrification)
- MONREC (for biomass availability)
- Myanmar Engineering Society
- Renewable Energy Association of Myanmar (REAM)
- Hydropower for Community Empowerment in Myanmar (HyCEM)
- Small Hydropower Association of Myanmar (SHPAM)
- Asian Development Bank (2017) Off-Grid Energy Investment Plan
- World Bank – current investigations into floating solar in hydropower storages
- Myanmar National Electrification Program (NEP)
- Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)
- PACT
- Yoma Micro Power
- Myanmar Hydropower Developers' Association

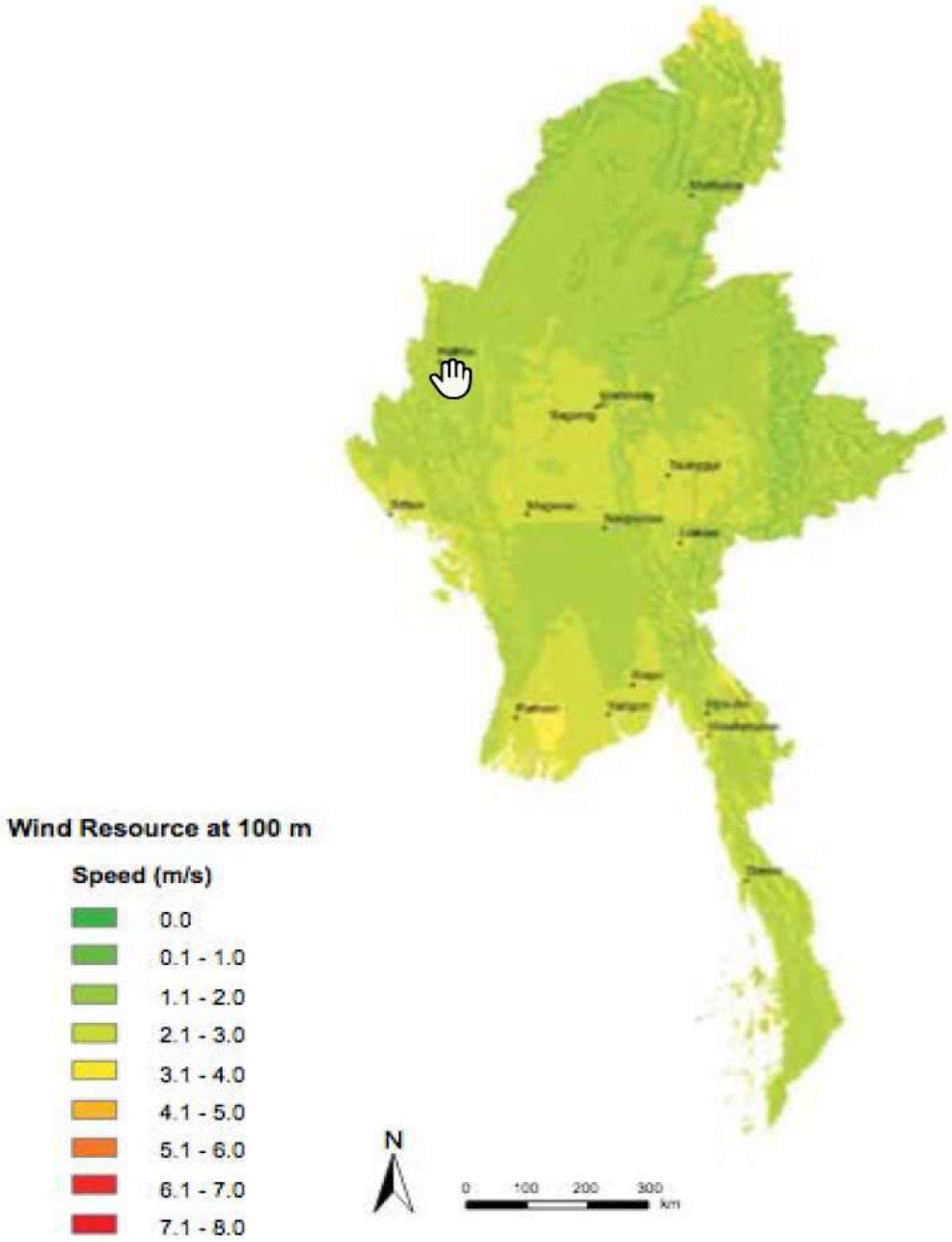
Other Renewables – Solar Power

- The solar resource in Myanmar is considered good
- The Regions of Magway and Mandalay have the highest solar potential
- There are no known solar PV power proposals identified for the Myitnge
- Floating solar opportunities are presently being evaluated, and 3 sites have been selected for pre-feasibility studies (not in the Myitnge)



Other Renewables – Wind Power

- The majority of Myanmar has an average wind speed less than 4 m/s
- This is considered inadequate for commercial applications.
- There are no known wind power proposals identified for the Myitnge basin.



Source: ADB (2017) Off-Grid Energy Investment Plan

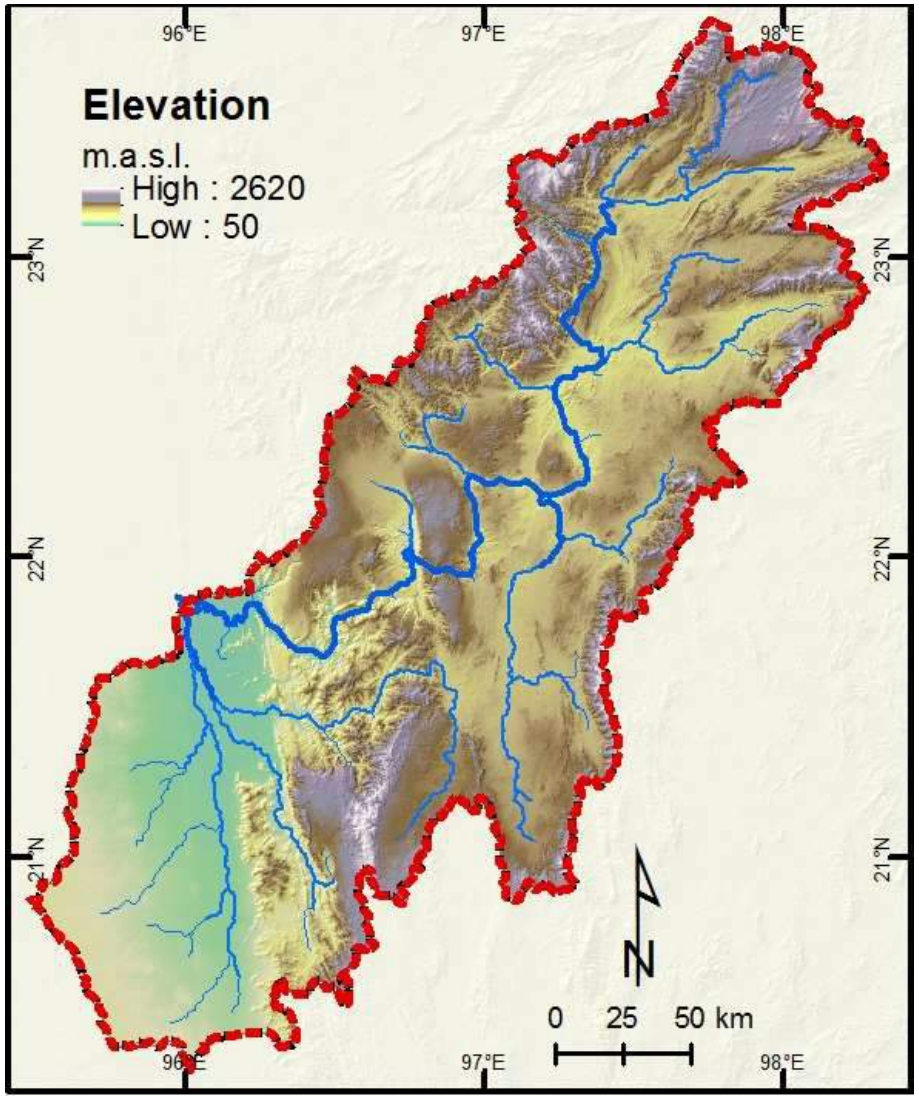
Other Renewables – Small Hydro

- There is a recognized small hydropower resource in both Mandalay Region and Shan State.
- The ADB 2017 report shows 74 potential small hydro projects in Shan State and 10 in Mandalay Region.
- Whilst some private small off-grid hydro plants have been identified in the Myitnge, no on-grid small hydro are known in this basin.

Myanmar Energy Monitor article, dated 22 December 2015:

- The Mandalay regional government granted initial approval for the development of two small-scale private hydropower plants along the Gal Laung stream in Pyin Oo Lwin Township, 8.3 MW and 7.3 MW, to be developed by Ngwe Ye Pale, a Mandalay- based company.
- There are currently two private, medium-scale hydropower plants operational in the Mandalay Region, located in Moguk Township and Wutwun village, Pyin Oo Lwin Township

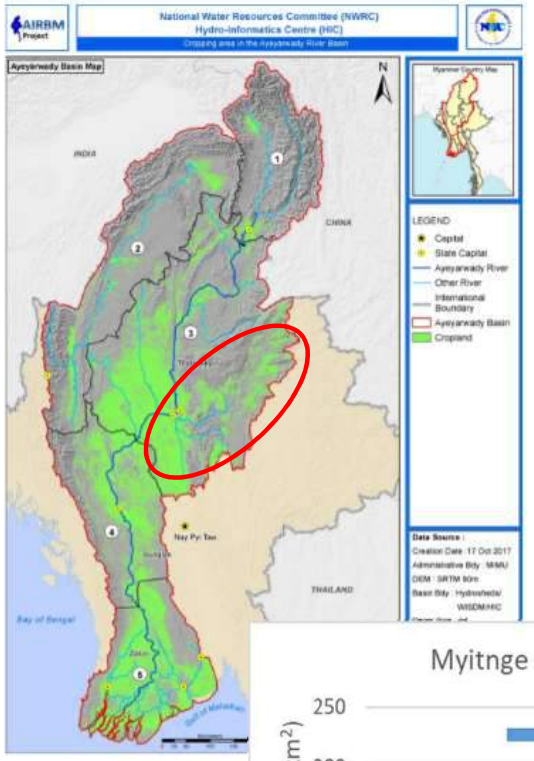
Environment - Landscape



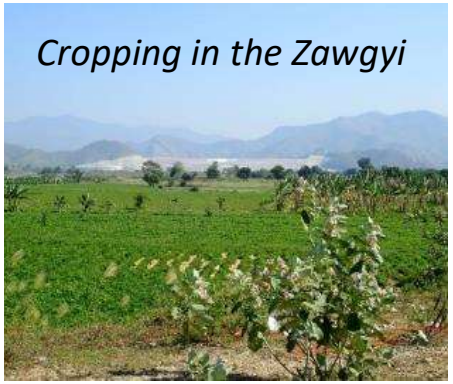
- Myitnge landscape is varied and reflects the complex regional geology
    - Sagaing fault separates the catchment into two distinct zones
- Eastern and central catchment has rugged and elevated mountains, with rivers in deep gorges – higher rainfall
- Western Zawgyi catchment is low-lying with low relief
- Mytinge is similar to a ‘mini’ Ayeyarwady, with mountains, dry valley and large river system

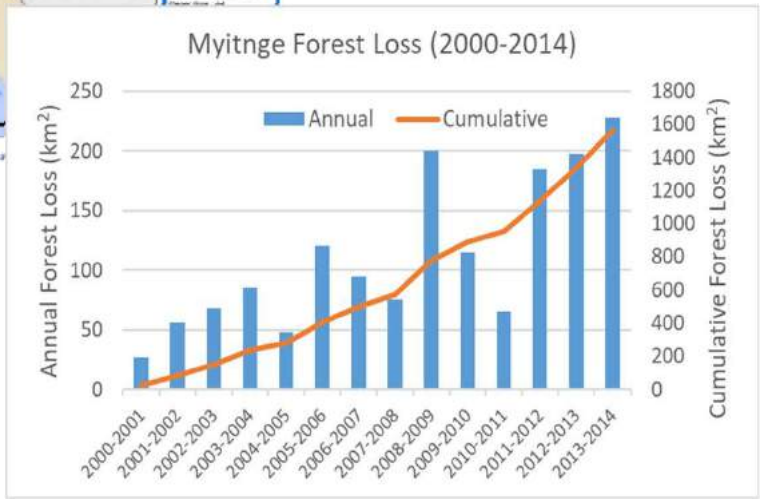
Environment – Land-Use

- Land-use follows landscape
- Dominant land use is agriculture
    - Highly developed on low-laying Zawgyi and on elevated, flat areas of the middle and upper Myitnge
- Other land-uses include:
    - Small scale gold mining in upper Myitnge
    - Mining of limestone for cement
    - Hydropower and irrigation dams
    - Villages/towns
- Forest loss is a major driver of environmental change, with rates increasing in the Mytinge



Binney et al., (2017)



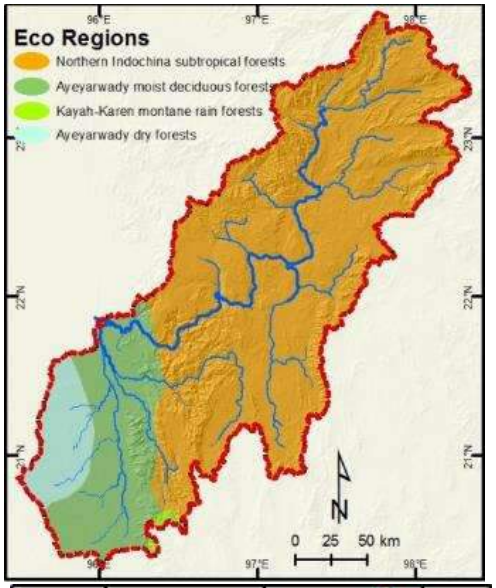


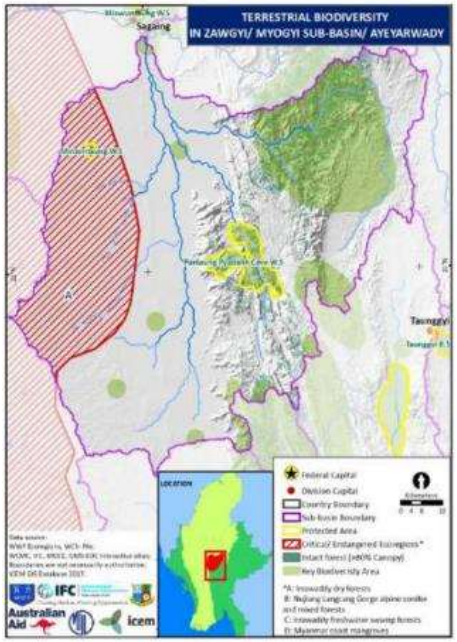
Hansen et al. (2013)

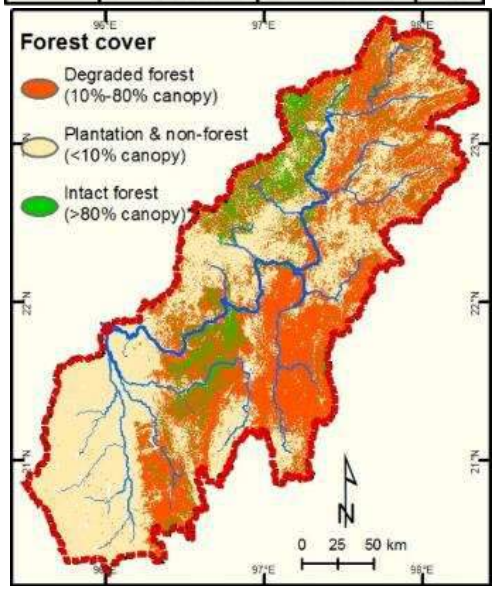
Environment – Terrestrial Biodiversity

- Myitnge encompasses a range of eco-regions
  - 11 KBA's in the basin
  - Widespread karst
- Information on biodiversity is very limited, estimated/known in Myitnge includes:
  - 70 – 80 species mammals
  - At least 500 species birds
  - The globally threatened Baer's Pochard (*Aythya baeri*)
  - Endemic & critically endangered roofed turtle (*Kachuga trivittata*)
- Habitat loss/degradation major threat

Burmese roofed turtle





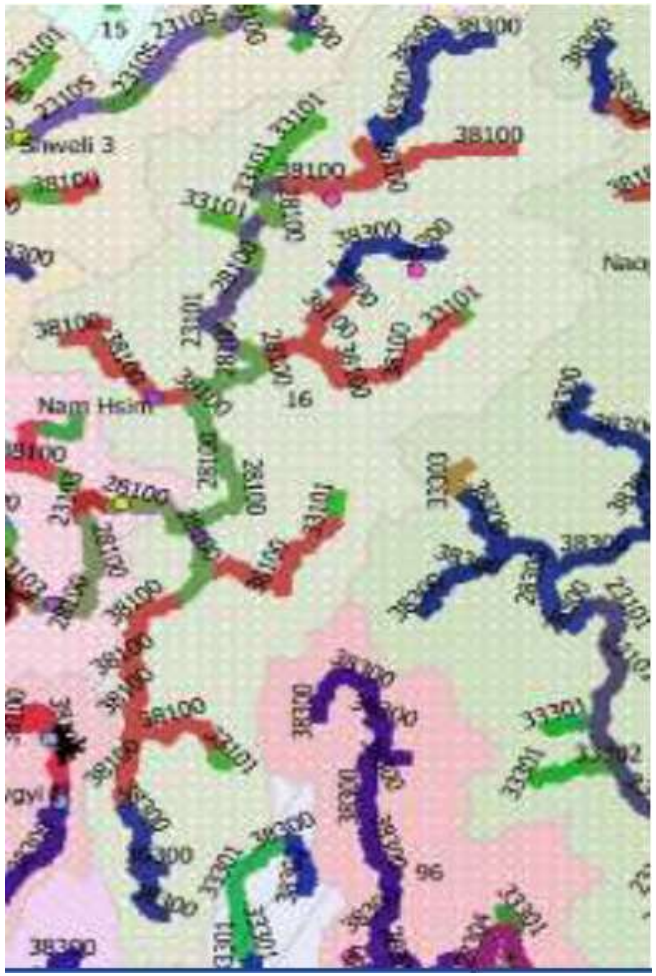


KBAs in Zawgyi sub-basin. From SEA

Environment – Aquatic Biodiversity

Irrawaddy Dolphin

- Information on aquatic biodiversity is very limited
  - SOBA provides Ayeyarwady-wide context
  - SEA used spatial analysis of river types as surrogate for biodiversity
- 90 fish species were collected from the Middle Ayeyarwady in 2017, including at least 5 species new to science (Kottelat, 2017)
- KBAs include aquatic components:
  - Lower Myitnge included in KBA for Irrawaddy dolphin
  - Important breeding grounds for fish
- Presence of Yeywa dam eliminates connectivity between middle and upper Myitnge and Ayeyarwady, whereas there is full connectivity upstream of Yeywa
- Dams alter flow regimes and sediment delivery to aquatic habitats



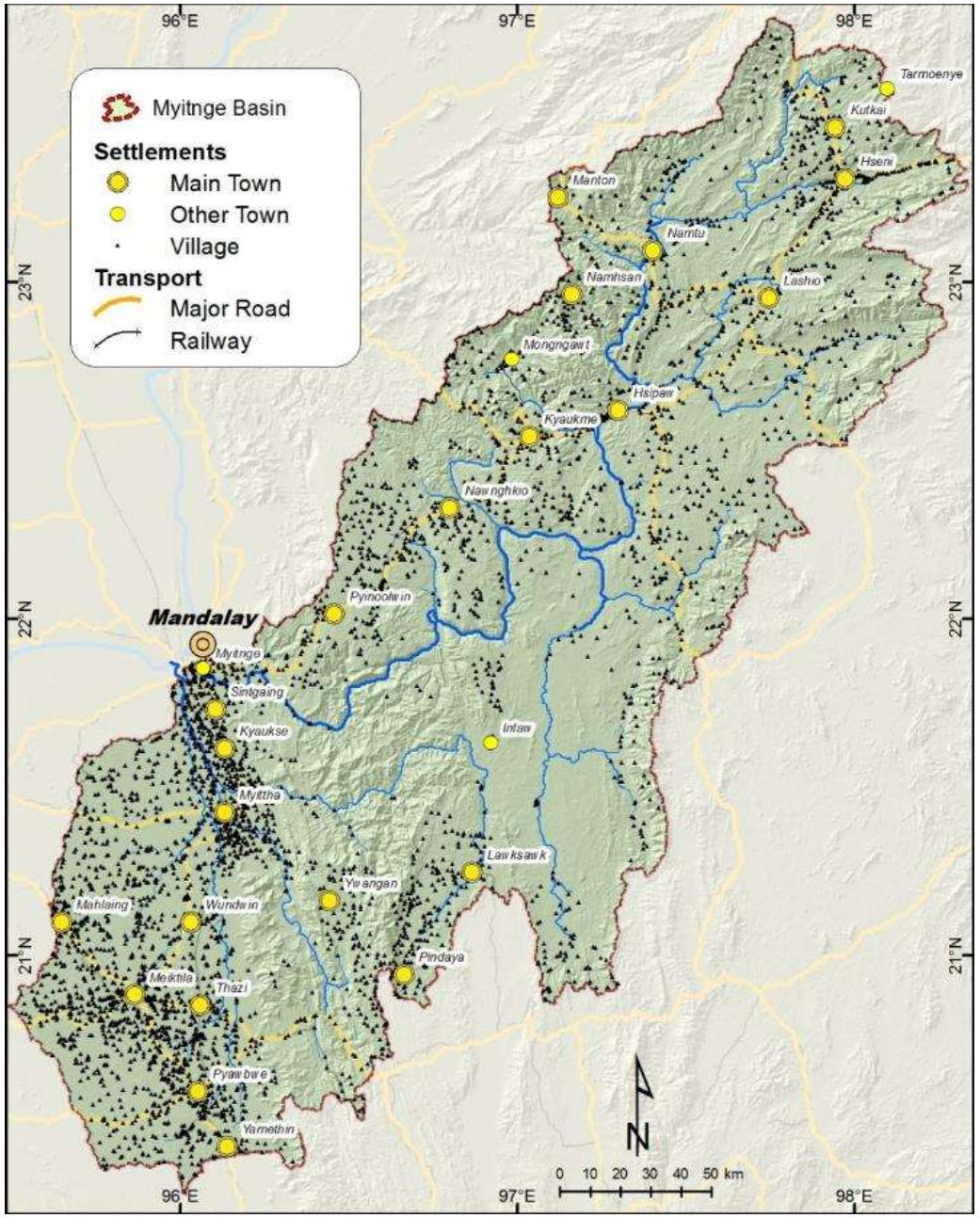
Example of river reach classification From SEA

Socio-Economics – Main Sources of Information

- Census 2015 and Statistical Yearbook 2017
- Strategic Environmental Assessment (SEA) of the Hydropower Sector 2017
- Ayeyarwady State of the Basin Assessment (SOBA) 2017
- State of Environment Report 2015
- ESIAs (Deedoke 2016 and Middle Yeywa 2018)
- Other sources with socio-economic data such as: WWF Irrawaddy River and the Economy of Myanmar 2018, WorldFish Myanmar Inland Fisheries 2015, etc.

Myitnge Basin Socio-Economic Characteristics

- Basin population: ~ 4 million
- Mostly in villages and towns
- ~25% below poverty line
- Agriculture as dominant source of livelihoods; irrigated in southern part of basin
- Diverse uses of Myitnge River, its water and its banks
- Access to water and land critical for rural development
- Ethnic diversity, conflicts



People interacting with the Myitnge River

Cropping and homes on the bank (affected by erosion), washing, fishing

Socio-Economic Concerns With Dams

Previous dams in basin have had mixed socio-economic impacts:

- Temporary economic boosts, improved power and water supplies (large benefits to relatively few irrigation farmers), improved infrastructure such as roads
- Displacement of people and disruption of village life
- Complex relationship with conflicts
- Some people may have to be re-resettled, which can be an even more traumatic experience

MYITNGE RIVER BASIN – LOCAL VIEWS

Stakeholder Meeting Objectives

The objectives of the Stakeholder Meetings are to:

- Engage stakeholders at the river basin level early in the Cumulative Impact Assessment Process of the Myitnge River;
- Introduce the Myitnge River Basin Integrated CIA Study; and
- Obtain and discuss information from relevant stakeholders about issues and concerns relating to power development in the basin (hydropower and other renewables), to ensure the study is appropriately informed, draws on local knowledge, and creates a sense of a participatory approach.

Myitnge River Basin Consultations

Region/State-level Consultation Meetings

- Mandalay Region : 3 Feb 2019 in Mandalay
- Shan State : 5 Feb 2019 in Taunggyi

Community Consultations

- Nget Kyi Theik village, Pyin Oo Lwin Tsp., Mandalay Mandalay
- Myogyi village, Ywa-ngan Tsp., Shan State
- Myo Haung village and His Paw Tsp., Shan State
- Lilu village, Nam Sam Tsp., Shan State

Region/State-level Consultation Meetings

Sub-national government: Region/state departments of MONREC, MOEE and other water-related departments

Civil societies: Interest groups including; environmental, natural resource, transparency and accountability, rule of law, peace and women groups

Sr.	Region/State	Stakeholder Group	#Number of Participants
1	Mandalay	Government	17
2	Mandalay	NGOs/CSOs	9
3	Shan	Government	23
4	Shan	NGOs/CSOs	12
		TOTAL	**61**

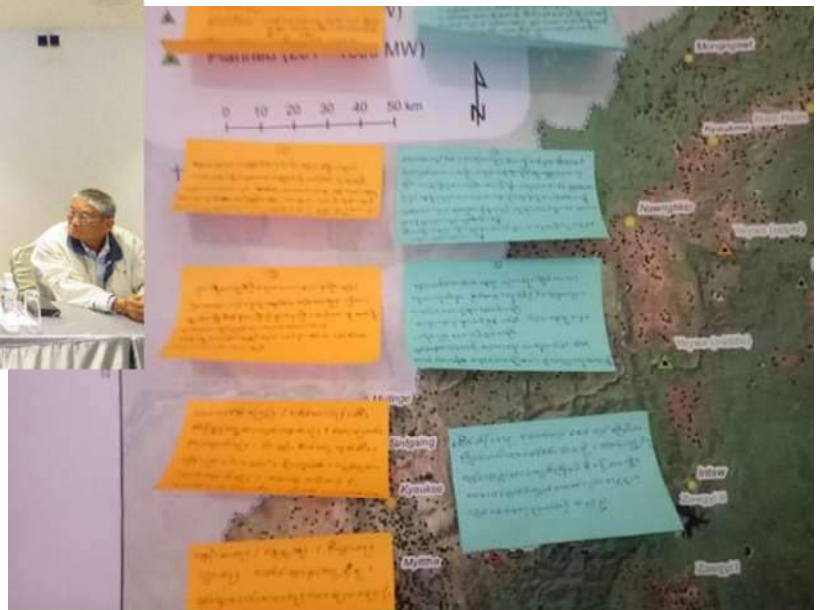
Shan Stakeholder Meeting

Mandalay Stakeholder Meeting

Introduction to CIA Project

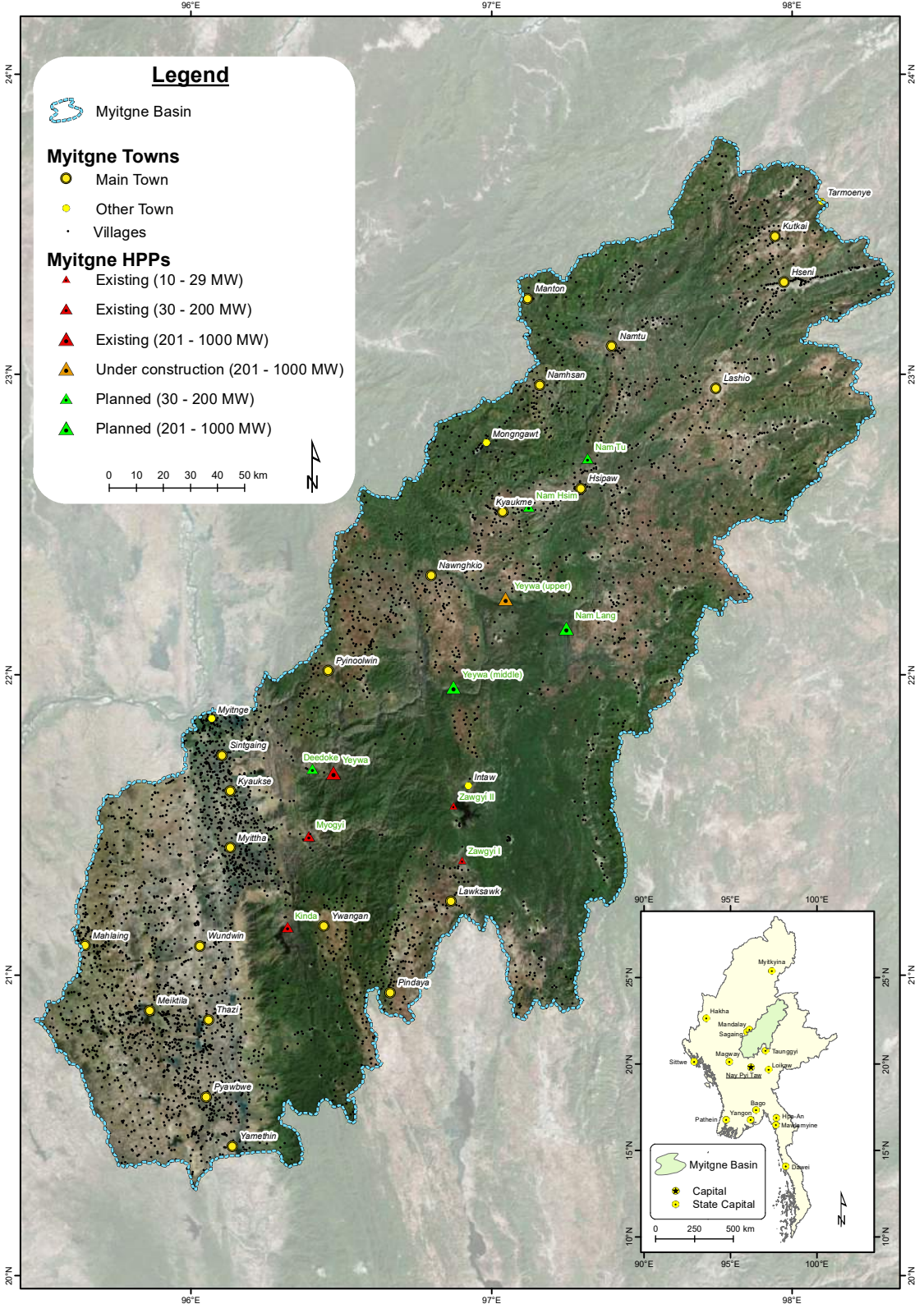
Group Activity 1

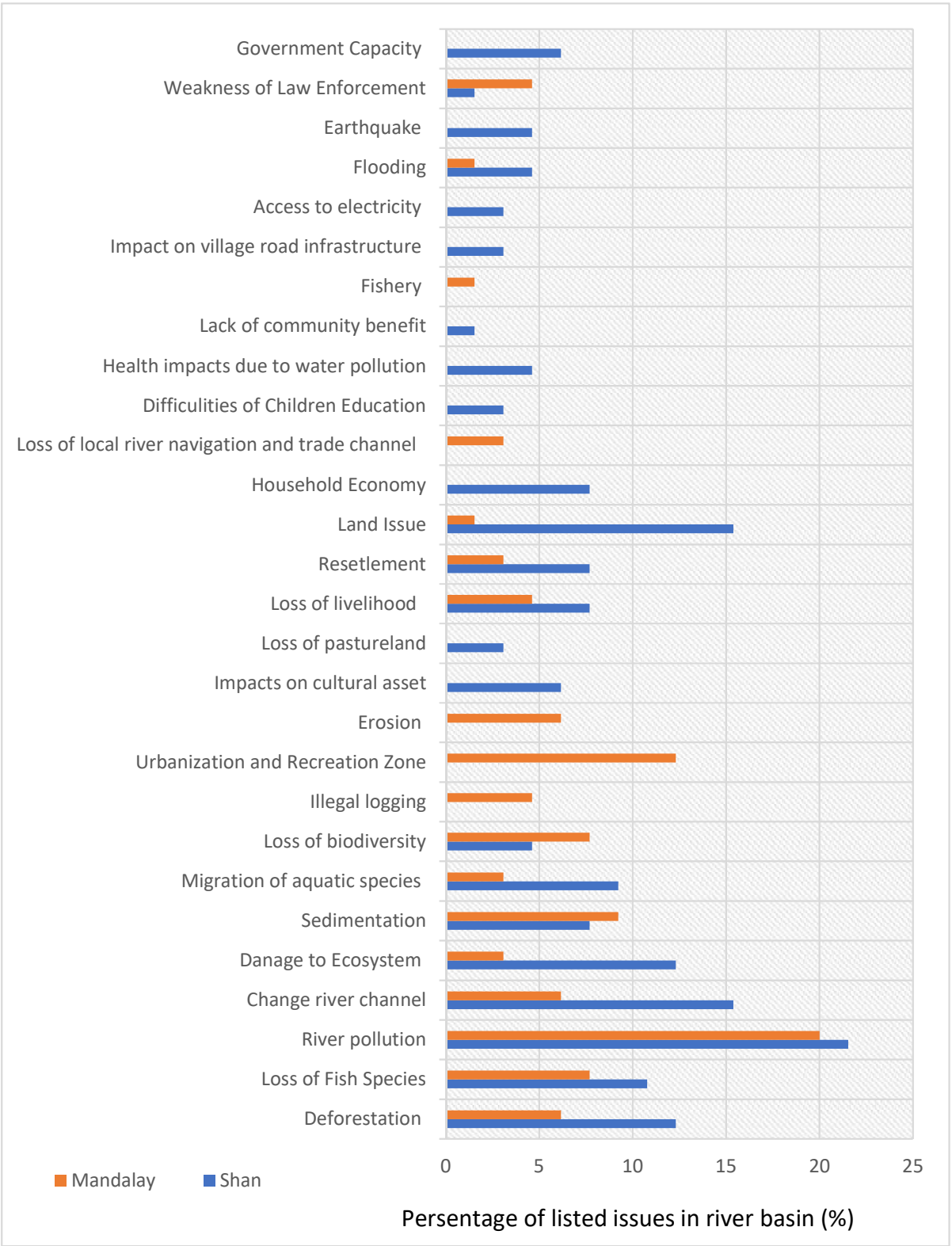
What are water-related issues and basin development opportunities in the Myitnge basin, relating to power development?



Group Activity 2

Participatory mapping of potential cumulative impact issues relating to power development





Issues raised by Stakeholders

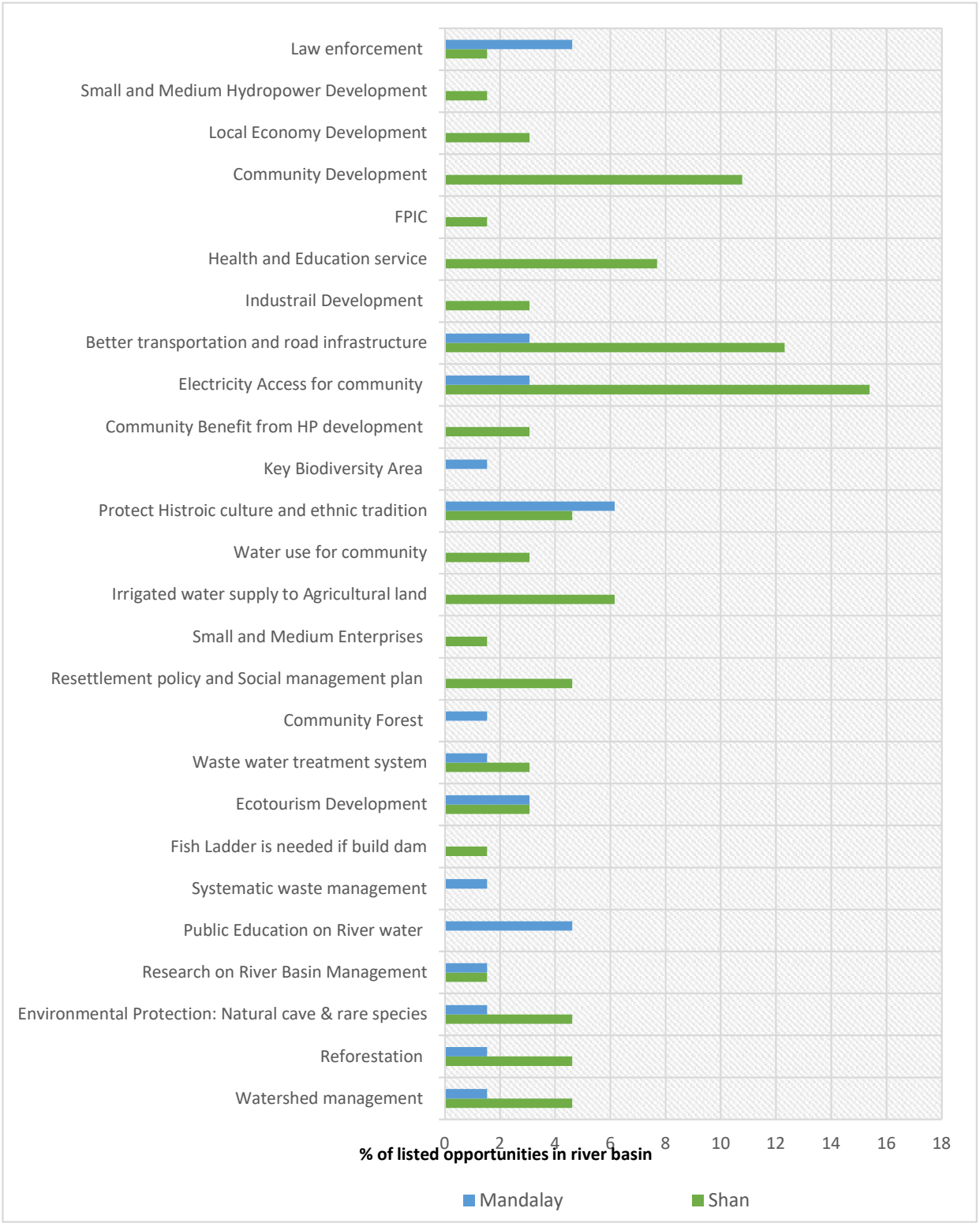
Stakeholders identified 65 issues.

Mandalay:

- River Pollution
- Sedimentation
- Loss of Fish Species
- Recreation Zones' impacts & urbanization

Shan:

River Pollution
Land Grab
Change river channel
Deforestation
Damage to Ecosystem



Opportunities listed by Stakeholders

Stakeholders identified 49 opportunities.

Mandalay:

- Protecting cultural assets and ethnic tradition
- Ecotourism Development
- Public Education
- Law Enforcement

Shan:

- Electricity Access for community
- Transportation
- Health and Education service
- Community Development and Local Economy

Mandalay Regional Meeting: Issues

River pollution: Polluted water because of uncontrolled mining and waste-water disposed from industries. As consequences of these development activities, there will be damage to aquatic ecosystem, loss of fishes and river morphology.

Deforestation: deforestation and loss of biodiversity were identified as the significant issue.

Sedimentation: Reducing flood frequency and intensity results loss of annual river's deposition, followed by loss of fertile soil for cultivation.

Livelihood: Communities forced to accept project and land confiscated. The action threaten traditional livelihoods.

Recreation Zones: recreation zones such as water park and resort hotel are gradually developing along the riverbank of Myitnge River. The tourism sector growth causes mass waste disposal and poor water quality.

Mandalay Regional Meeting: Opportunities

Environmental assets: Ecosystem and wildlife can be protected through establishing community forest and creating additional protected areas for wildlife.

Water resource management: establish waste-water treatment system; and also watershed area

Benefit Sharing: highlighted that importance of sharing benefits from Hydropower Plants with ethnic minority groups and local communities.

Research and Public Education: should conduct research on river management and should provide public awareness to local communities along the river.

Alternative energy: solar power were mentioned as opportunities.

Development: Agricultural development and water supply to communities could be improved by improving irrigation system. More opportunities are ecotourism development, trade and business.

Shan State Meeting: Issues

Environmental pressures: Deforestation; illegal logging; Damage to ecosystems and changes in river flows due to existing hydropower projects; Loss of fish species due to hydropower, discussed as a future concern; Increased Sediment and Water quality degradation

Livelihood: concern that farmland and pasture land would be threatened by past and future hydropower dams.

Resettlement: Further displacement and resettlement in connection with the construction of hydropower dams is a serious issue.

Armed conflicts: There are many ethnic armed groups: TNLA, RCSS, SNPP and Wa armed groups in this area. In the current situation, TNLA and RCSS are still in battles.

Shan State Meeting: Opportunities

Hydropower Development: Hydropower could contribute to improved local economy; recognized that electricity is needed for industrial development, education and living standards of the people.

Policy Making: formulation of resettlement policy with regarding to hydropower is important; and also reported the need for effective laws for the hydropower sector.

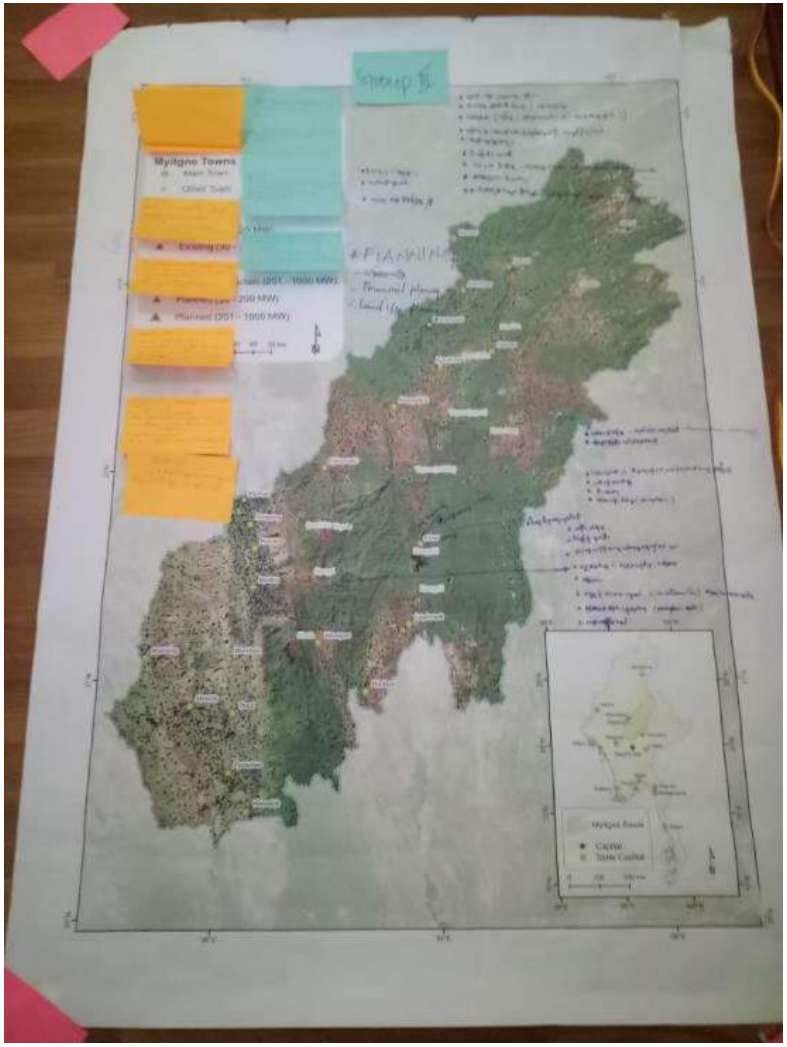
Dam Design: Fish way and fish ladders should be included in hydropower dam design.

Financial Resource: It needs to make Financial Planning on River Basin management

Benefit sharing: promoted the equal sharing of natural resources, especially share benefits from hydropower. [Benefit: Access to electricity, water for irrigation/livestock, employment and revenue generation]

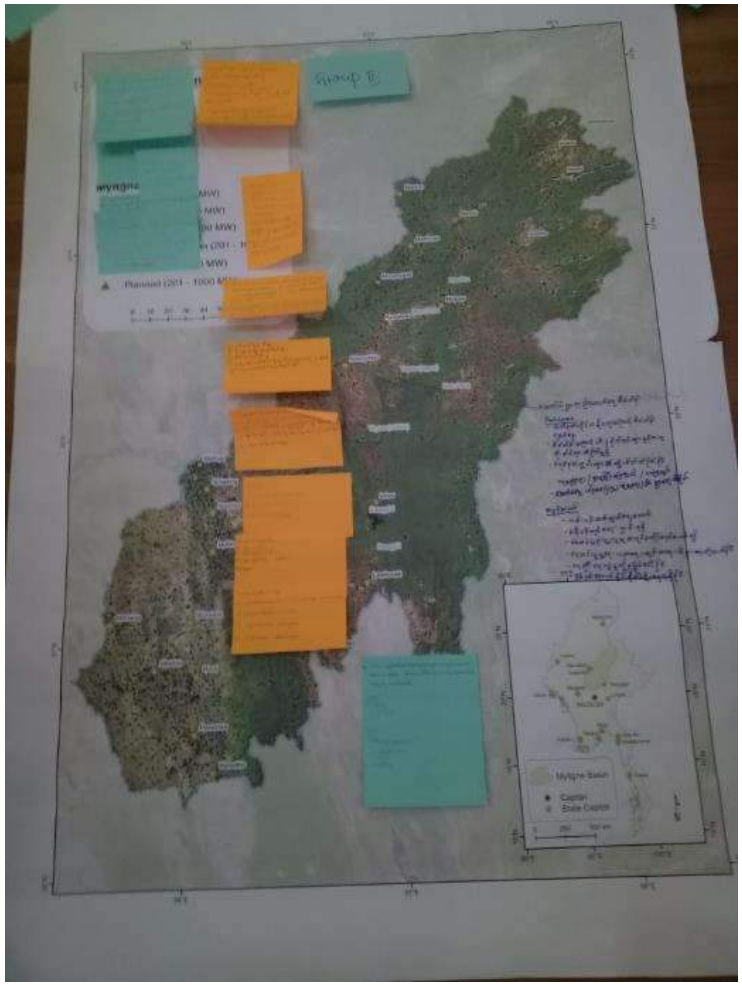
Participatory Mapping of Mandalay Meeting

- Conflict: **security issues because of active ethnic armed conflicts**
- Resettlement: **Changes in community dynamics as a result of displacement**
- Livelihood: **The confiscation of land often leads to loss of employment, which is a critical issue as there are limited employment opportunities in the rural area**
- Aquatic Species: **Past hydropower projects threaten to vanish fish species**
- Water Quality: **Polluted water released from multiple point-source discharges**



Participatory Mapping of Shan Meeting

- Ecosystem and Biodiversity: **Loss of fish species and wildlife populations; Habitat fragmentation**
- Ethnic Customary Land: **Loss of ethnic customary Land**
- Resettlement: **Loss of possessions: shelter, existing road, school and health centre as a result of displacement**
- Socio-economic: **Loss of productive Land is high impact for communities**
- Law Enforcement: **Weakness of government capacity on controlling environmental problems and monitoring environmental flow**



Community Consultations

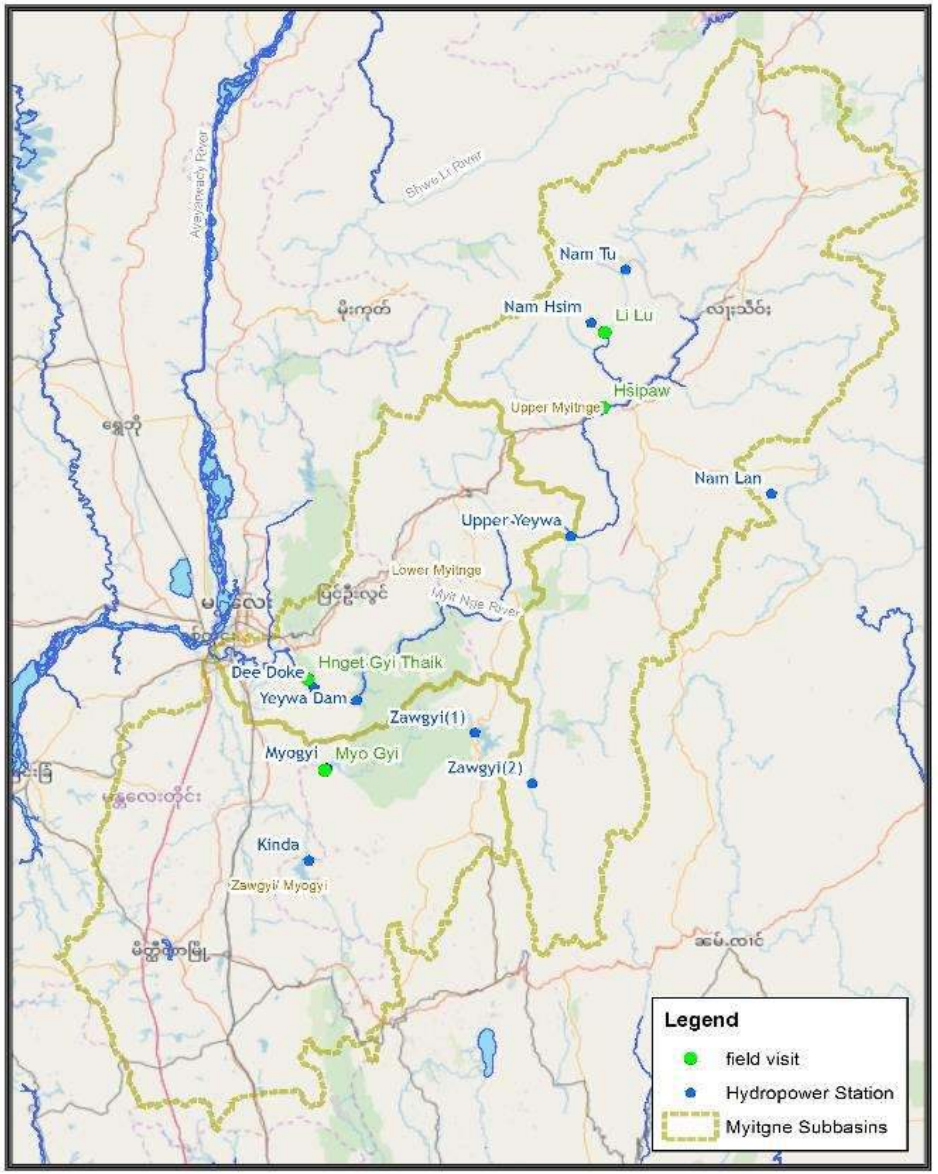
Nget Kyi Theik village, Pyin Oo Lwin Tsp., Mandalay
#Dee-doke Hydropower Plant

Myogyi village, Ywa-ngan Tsp., Shan State
#Myo Gyi Dam

Myo Haung village and His Paw Tsp., Shan State
#Upper Yeywa Hydropower Plant

Lilu village, Nam Sam Tsp., Shan State
Nam Tu Hydropower Plant

Field Site For Basin Visit



Nget Kyi Theik village # Dee-doke Hydropower

- **Location:** in Pyin Oo Lwin Township, about 30 km southeast of Mandalay.
- **Main Livelihood:** Farming
- **Nationality:** Bamar, Buddhist
- **Resettlement:** 31 households of Ye village and 2 households of Pan village
- **Land:** the cultivated land of roughly 400 acres owned by the 11 villages
- **Company Activity:** Site Office, Early Engagement, grievance mechanism, EIA consultation
- **Villagers' recommendation:** to be effective administrative procedure on compensation process.

Myogyi village #Myo Gyi Dam

- **Location:** in Ywa-ngan Township, Shan State
- **Main Livelihood:** Agriculture
- **Nationality:** Ethnic-Danu, Buddhist
- **Resettlement:** Two villages were resettled.
- **Land:** Four villages lost farmland.
- **Negative Impacts:** loss of farmland, loss of livelihood, children' education, become migration workers, loss of fish species
- **Positive Impacts:** better road infrastructure and electricity access
- **Villagers' recommendation:**
  +Fair compensation amount to ethnic area
  +Establishing Factory and small industry
  +Developing Small and Medium Enterprise
  +Better Law enforcement on development impacts
  +Consideration on Community Benefit when building dam

Myo Haung village and His Paw Tsp #Upper Yeywa HP

- **Location:** in Hsi Paw Tsp, Shan State
- **Main Livelihood:** Farming, Other Livelihood: Fishery and Sand Mining
- **Nationality:** Shan, Buddhist
- **Villagers' Concerns:** Affected both riverine villages (~16 villages) and agricultural land and traditional livelihood
- **CBOs' concerns:** land grabbing, forcibly displacement, livelihood, flooding, armed conflict and lack of community benefit
- **Movements:** signing campaign, mass demonstration, press conference, community prayer
- **Recommendation:**
  - +To be more transparent on building hydropower plants
  - +No land & no resettlement
  - +To be made sure about community benefit in hydropower plants
  - +To make early engagement and community participation

Lilu village # Nam Tu Hydropower

- **Location:** in Nam Sam Township, the Pa Laung Self-Administered Zone in northern Shan State
- **Main Livelihood:** farming, livestock and tea-leaf garden
- **Nationality:** Shan, Buddhist
- **Villager' Concerns:** worried about flooding and impacts on village livelihood by future dam
- **Contested Area:** controlled by different ethnic armed groups: TNLA and RCSS

QUESTIONS AND DISCUSSION ABOUT MYITNGE BASIN ISSUES AND KNOWLEDGE GAPS

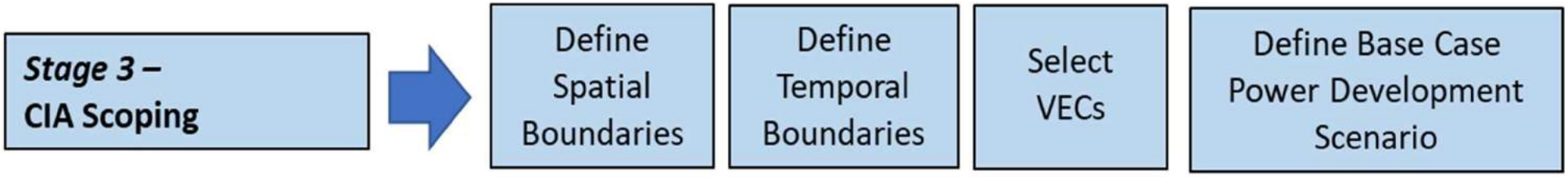
BREAK

CAPACITY-BUILDING
CIA SCOPING

CIA Scoping – What and Why?

Important scoping requirements:

- Spatial boundaries
- Temporal boundaries
- Base Case Power Development Scenario
- Valued Environmental and Social Components (VECs)



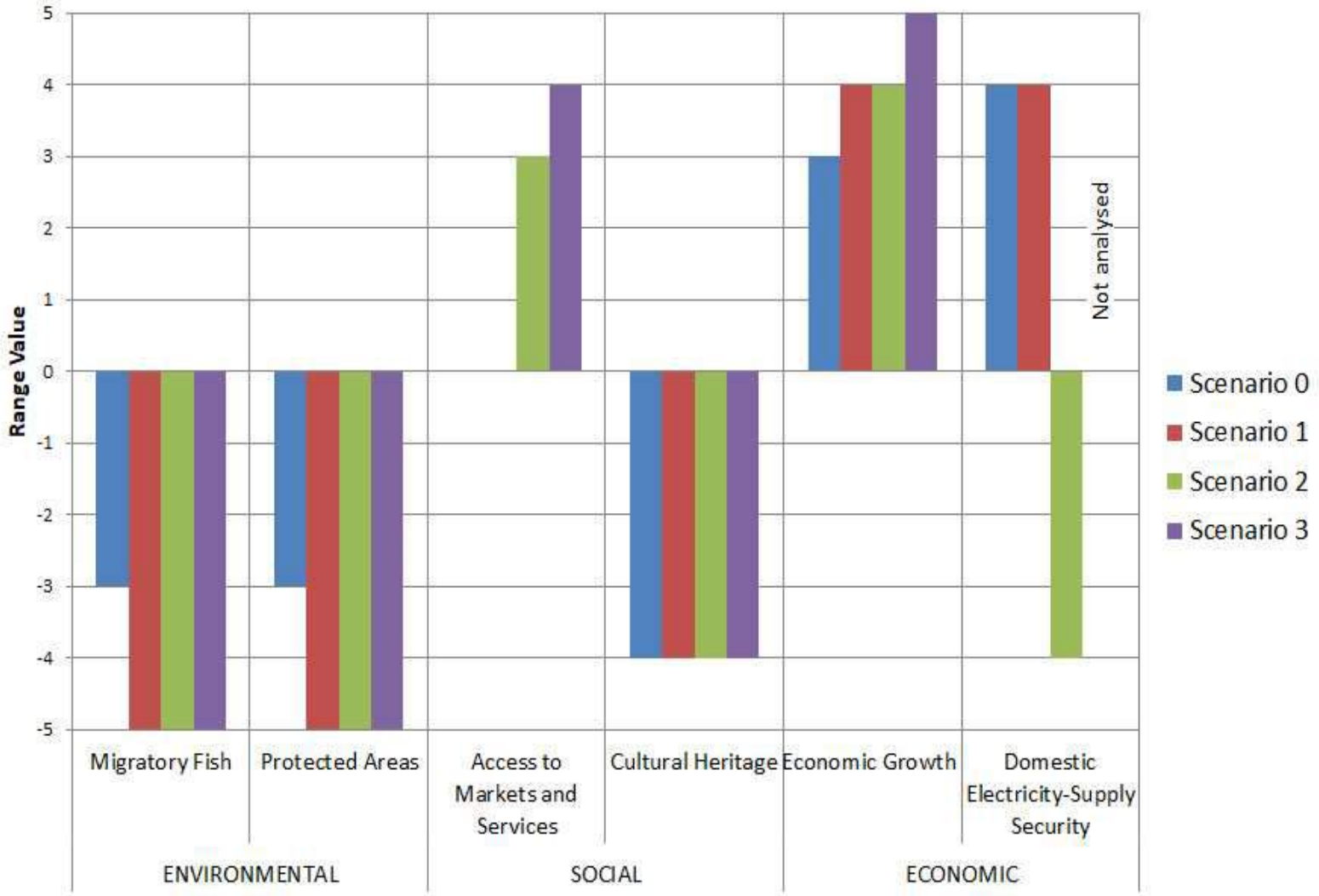
Influences on CIA Scoping Decisions

- The management questions that the CIA seeks to answer
- The resources available to the study – time, expertise, budget
- The availability of data, and the quality of that data
- Keeping it all manageable

Reminder of Important Questions for the Myitgne CIA

1. What are the important considerations, values and concerns within the basin that should be focussed on when considering potential cumulative impacts?
2. What cumulative impacts arise for the planned Base Case power development scenario?
3. What is possible to do differently? Where is there “room to move”?
4. What are some possible different power development scenarios, and what cumulative impacts are associated with these?
5. What is the best combination of adapted power development approaches and mitigation measures for environmental and social impacts?
6. How can we ensure that this “optimal” development scenario can be delivered?

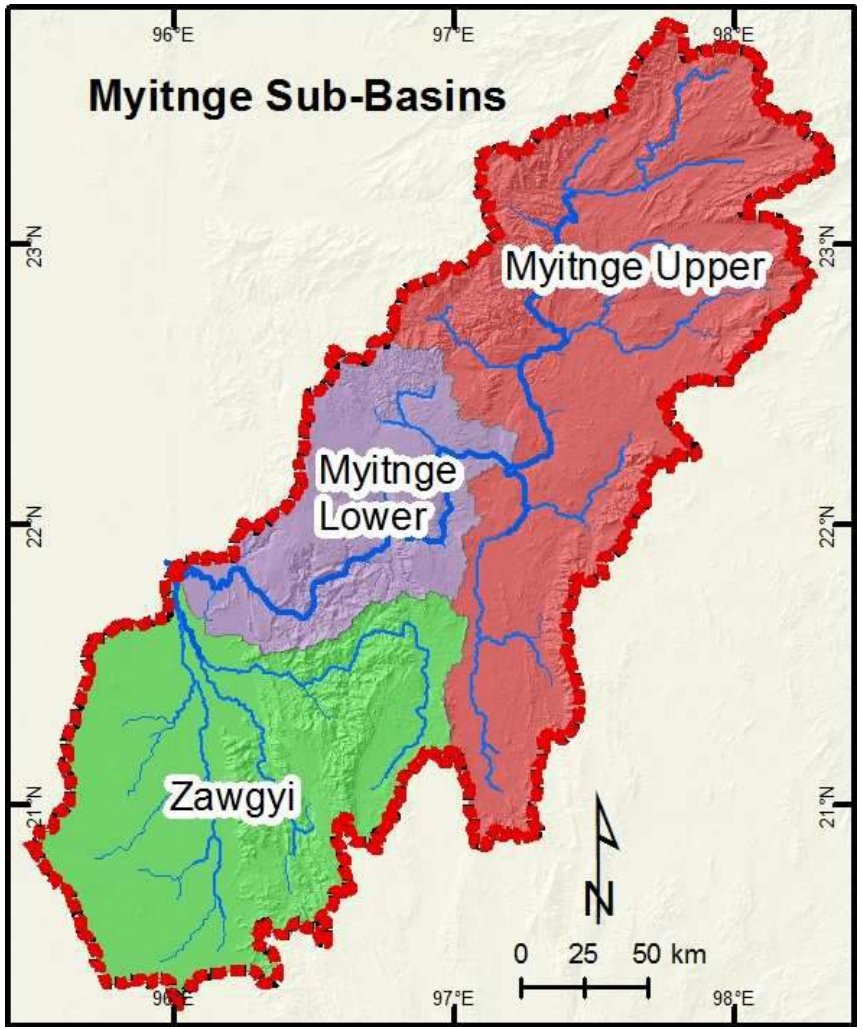
Ensuring Final Results are Not Overly Complex and Can Support Management Planning and Decision-Making Needs



ESTABLISHING SPATIAL BOUNDARIES FOR THE CIA – Options, Group Discussion

Spatial Boundary Considerations for Myitnge CIA

- The mainstem of the Myitnge River to a specified distance **upstream**.
- The mainstem of the Myitnge River to a specified distance **downstream**.
- **Tributaries** to the mainstem Myitnge River.
- Development areas for alternative **renewable energy** generation in the basin.
- **Associated infrastructure** (e.g. transmission lines, roads) and ancillary activities (e.g. transport of construction materials to the project site).



- Should positive impacts (such as power generation, flood control) or negative impacts (such as fisheries) outside the basin should be included in analysis?

ESTABLISHING TEMPORAL BOUNDARIES FOR THE CIA – Options, Group Discussion

Why Define Temporal Boundaries?

- Need to define the time period to be considered in the study
- Different aspects may determine the time period relevant to consider

Proposals for Temporal Boundaries

Planning horizon

- Power and other development plans out to a specified year, for instance 2030. The National Electricity Master Plan goes out to 2028, and sectoral masterplans go out to 2030.

Longevity or time scale of impacts

- Longevity of impacts from the different power development scenarios. It is proposed that these are considered out to 2050, which would take into account long-term effects such as riverbank erosion and geomorphology (natural phenomena with a long time-scale)
- For some environmental and social impacts different temporal impacts should be considered. An example is reservoir lifetime, which from sedimentation point of view should be relevant out to 2100, i.e. around 75 years lifetime, and climate change.

ESTABLISHING THE BASE CASE POWER DEVELOPMENT SCENARIO FOR THE CIA – Options, Group Discussion

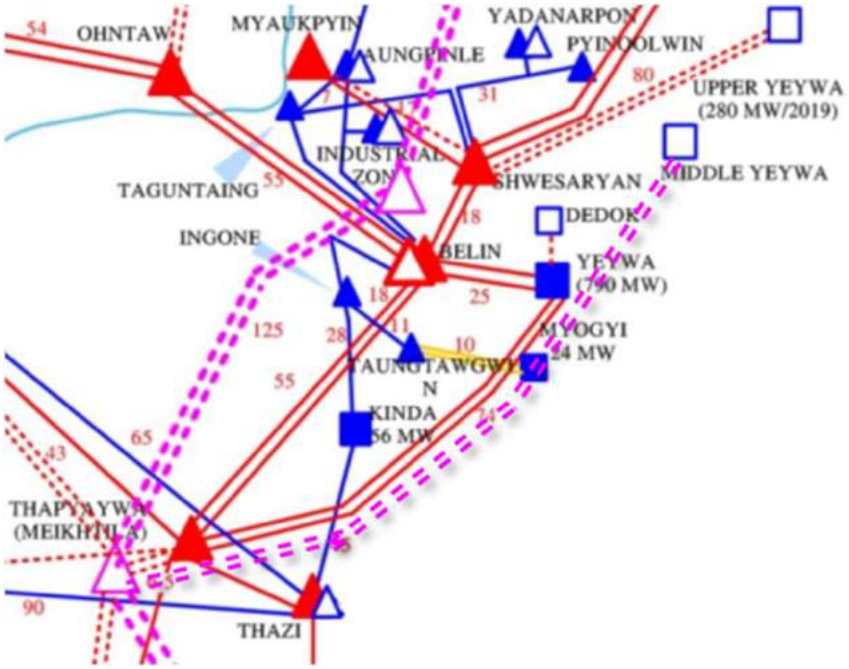
What Do We Mean by Base Case Scenario for this CIA?

- The Base Case Scenario is the present power development situation, within the area defined by the spatial boundaries and projected out to the time periods defined as the temporal boundaries for the CIA.
- A CIA of the Base Case Scenario will highlight cumulative impacts on the selected VECs in the absence of additional interventions.
- Following the Base Case Scenario CIA, the cumulative impacts associated with this presently planned scenario will be evident.
- Then, Alternative Scenarios will be defined that are variations from the Base Case, and these will have CIA analyses conducted on the same set of VECs.

Base Case Scenario – Generating Plants

- All existing power plants (Yeywa, Myogyi, Zawgyi I, Zawgyi II, Kinda) are in operation.
- All planned and projects under construction in lower basin (Upper Yeywa, Middle Yeywa and Deedoke) are completed and commissioned.
- All 3 upper basin projects (Nam Tu, Nam Hsim, Nam Lam) are completed and commissioned.
- Yeywa will change operation pattern after commissioning of the 500 kV transmission line.
- No other on-grid renewable energy projects are developed in the basin.
- No environmental flows are considered in the Base Case.

Base Case Scenario – Transmission Lines

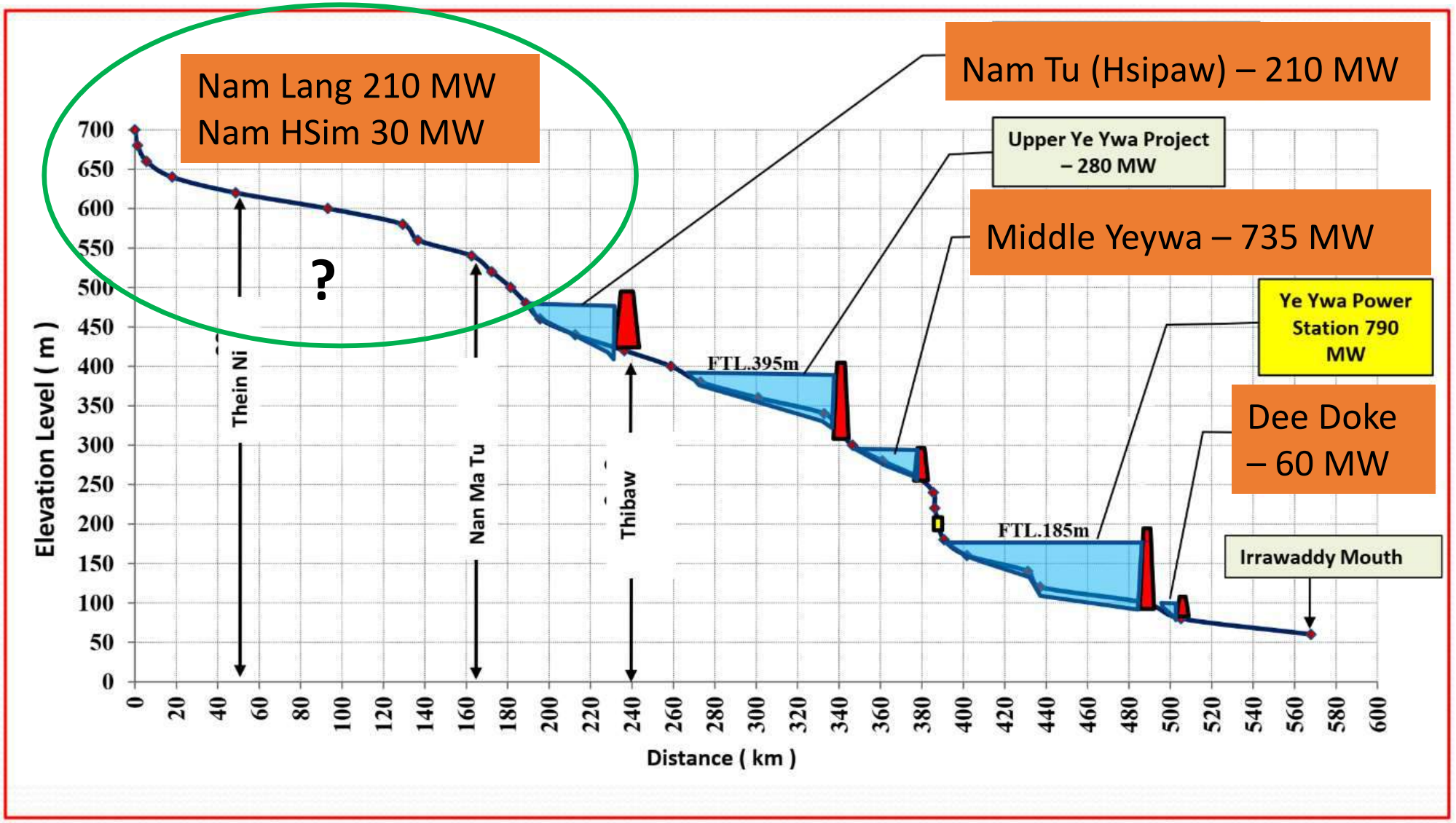


- 500 kV line from Meikhtila - Taungoo - Phayargyi - Hlaingtharyar substations is already underway.
- Middle Yeywa HPP connection to the system: proposed through building two 500 kV lines to the 500 kV Meikhtila substation, L = 200 km.
- 230 kV line from 280 MW Upper Yeywa HPP to existing 230 kV Shwesaryan substation: completed in 2021
- Connection from 100 MW Nam Tu HPP to the grid: a 230 kV line to 230 kV substation of Upper Yeywa HPP following the planning option.
- Connection from 210 MW Nam Lang HPP to the system: 230 kV line to the existing 230 kV Shwesaryan substation (require an upgrade Shwesaryan substation).
- 60 MW Deedoke HPP is planned to connect to the existing 230 kV substation of Yeywa HPP.
- 30 MW Nam Hsim HPP may connect to the existing 132 kV Pyindowin substation

Base Case Power Development Scenario – Issues for Discussion

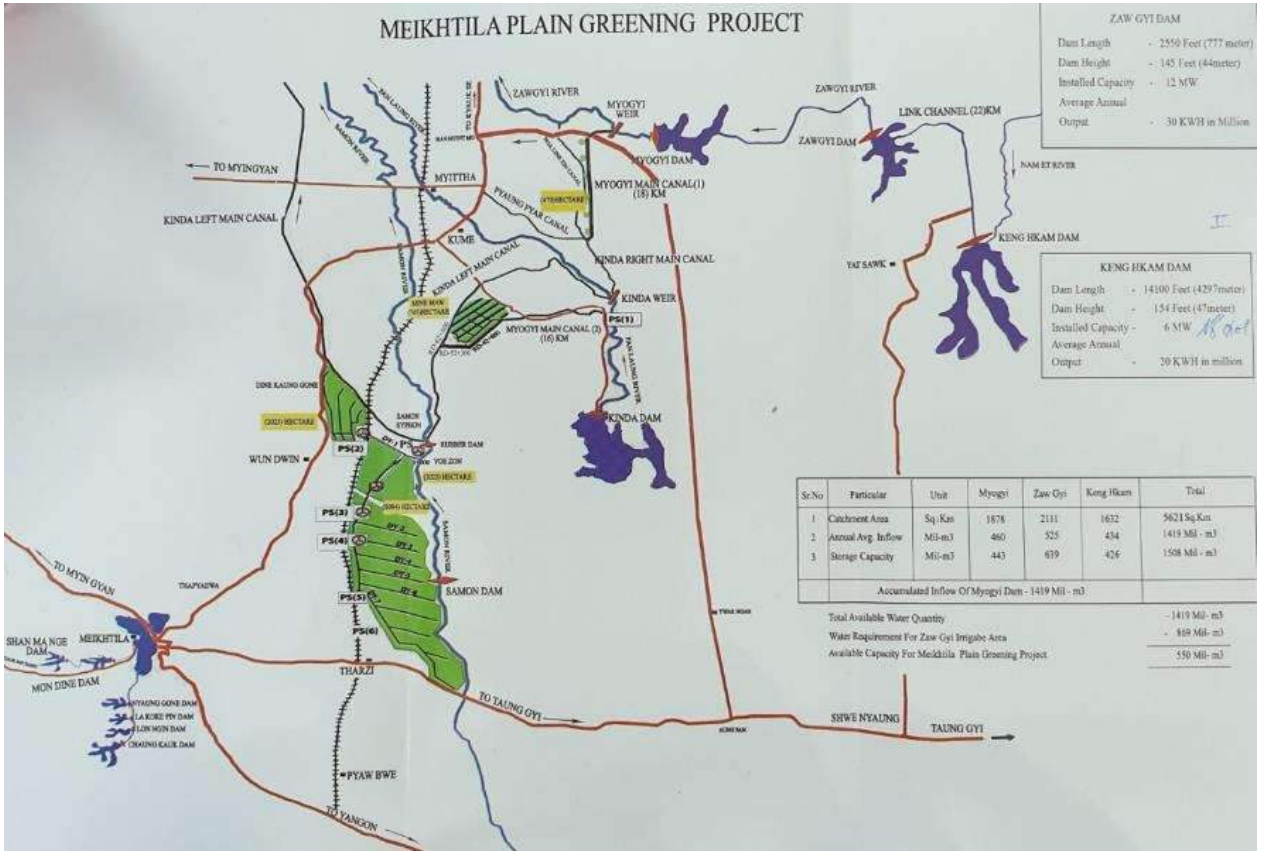
- Do we need to analyze all power developments in the full Myitnge Basin to get the main benefits of this study, or just the main Myitnge cascade hydropower plants?
- Existing and planned small – medium size hydropower developments.
- Existing and planned multipurpose projects.
- Individual investment costs for the planned hydropower projects.
- Water management plans, Sediment management plans?
- Other RE plans
- Information gaps, e.g. feasibility studies ….

The Myitnge River Hydropower Cascade



Base Case Scenario – Zawgyi Sub-Basin Considerations

- All four hydropower plants are part of multipurpose reservoirs.
- There is limited and conflicting information.
- The water management concept unclear.
- There may not be a lot of options for alternative scenarios and actions.



DAY 1 SUMMARY AND PLANS FOR DAY 2

DAY 1 CLOSE

Myitgne River Basin CIA Study

INCEPTION WORKSHOP
MISSION 2: 13-14 FEBRUARY 2019
NAY PYI DAW, MYANMAR

IFC
International Finance Corporation
WORLD BANK GROUP

Creating Markets, Creating Opportunities

MOEE

MONREC

SWECO

IN PARTNERSHIP WITH:
Australian Aid
UKaid

REVIEW OF PREVIOUS DAY AND AGENDA FOR DAY 2

Review of Workshop Agenda – Day 1

- 09:00 Opening remarks
- 09:30 Context and Vision for the Myitnge CIA
- 09:45 Implementation Plan for the Myitnge CIA
- 10:15 ***Questions and Discussion:*** Purpose and approach of the Myitnge CIA
- ***10:30 BREAK***
- 11:00 ***Capacity-Building:*** Introduction to and Experiences with CIA
  - Role of CIA, steps from IFC Good Practice guide,
  - Global experience, lessons learned
  - The Kuri-Gongri Basin CIA in Bhutan
  - The Cumulative Impact Assessment Matrix (CIAM)
- 12:15 ***Questions and Discussion:*** About CIAs
- ***12:30 LUNCH***
- 13:30 ***Myitnge River Basin*** - State of knowledge, available information, local views
- 14:45 ***Questions and Discussion:*** Myitnge Basin issues and knowledge gaps
- ***15:15 BREAK***
- 15:45 ***Capacity-Building:*** CIA Scoping
- 16:00 Establishing spatial boundaries – options, discussion
- 16:15 Establishing temporal boundaries – options, discussion
- 16:30 Establishing the Base Case Power Development Scenario - options, discussion
- ***17:00 DAY 1 CLOSE***

Workshop Agenda – Day 2

- 09:00 Opening remarks
- 09:10 Review of previous day and objectives for Day 2
- 09:20 ***Questions and Discussion:*** Areas of concern regarding potential cumulative impacts in Myitnge Basin
- 09:45 ***Capacity-Building:*** Valued Environmental and Social Components (VECs)
  - Role
  - Selection criteria
  - Selection process
- 10:05 Candidate VECs for the Myitnge Basin
- 10:25 Explanation of small group work
- ***10:30 BREAK***
- 11:00 ***Small group work:*** Analysis of candidate VECs
- ***12:30 LUNCH***
- 13:30 Report back from small groups
- 14:15 ***Questions and Discussion:*** Myitnge Basin CIA potential VECs
- 14:45 Review of CIA scoping options and key messages from workshop discussions
- 15:10 Closing remarks
- ***15:30 REFRESHMENTS AND CLOSE OF WORKSHOP***

DISCUSSION ABOUT MYITNGE BASIN AREAS OF CONCERN REGARDING CUMULATIVE IMPACTS

CAPACITY-BUILDING: VALUED ENVIRONMENTAL AND SOCIAL COMPONENTS (VECs)

What is a VEC?

- A VEC is a Valued Environmental or Social Component.
- A VEC can be defined as an environmental and/or social component that has scientific, ecological, social, economic, cultural, historical, archaeological or aesthetic importance or value.
- Value could be inherent or could be ascribed to the component by an individual, community, society, developer, scientist, regulator etc.
- A VEC is ***a receptor of impacts*** which can be measured (quantitatively or qualitatively).

Why Do We Need VECs?

- CIAs are inherently complex.
- VECs are a small set of focal areas that are analysed in the CIA process to illustrate the types and extent of cumulative impacts that may be of concern with the scenario being evaluated.
- VECs need to be carefully selected so that they will provide insightful results from the CIA.

How Do We Select VECs?

1. Identify a candidate list drawing from reference sources; and
2. Apply selection criteria for those suitable for the CIA analyses.

What Reference Sources are We Drawing From for this CIA?

- Client views
- National government agency views – MOEE, MONREC, DWIR, Irrigation
- Previous studies – Myanmar HPP SEA, Myitnge Hydropower-by-Design study, SOBA
- SEA River Basin consultations
- State and Regional government agencies
- NGOs and CSOs – e.g. MIID, WWF, FFI, TNC
- Developers
- Local stakeholders through River Basin Consultations during Jan-Feb 2019 for this study

What Selection Criteria Do We Apply to the Candidate VECs?

- Valued by stakeholders
- Important to the national vision and goals
- Potential for substantial impacts from hydropower developments
- Potential for cumulative impacts from multiple developments (versus local impacts)
- Easy to measure
- Possible to analyse the impact pathways
- Shows difference between scenarios
- Baseline data available from own studies or secondary sources
- Aspects with legal protection.

How Many VECs Do We Want to Select?

- For the Myitgne CIA, the integration of power development and optimization into the CIA is an important requirement, and the selection of VECs should help illustrate trade-offs amongst competing priorities.
- For this reason, it is proposed to select VECs under three headers:
  - Power system
  - Environmental
  - Socio-Economics
- There are no requirements on having a certain number of VECs in each category. They are selected based on priority.
- It would be desirable to have at least one in each category, and preferably no more than six in total to keep the CIA analyses manageable.
- Candidate VECs that are not selected does not mean they are not important. Often the results for the selected VECs can be used to inform likely results for the other candidate VECs.

CANDIDATE VECs FROM RESEARCH TO DATE – POWER SYSTEMS

Candidate VEC: Generation Capacity

- **Importance**: High. The JICA Master Plan shows a need for extensive development of generating capacity, both for base- and peak load, to meet forecast electricity demand for Myanmar by 2030.
- **Relevance**: Cumulative impacts increase as a direct function of the size of the project portfolio.
- **Indicator:** Average Annual Generation in kWh.
- **Data availability**: Would require confirmed data of present and planned generation for existing generating plants, plants under construction and planned generating plants. Hydrological flow series are required.
- **Other comment**: The hydrological regime requires increased regulation to meet generating capacity during periods with low natural water flows.

Candidate VEC: Firm Generation Capacity

- **Importance**: High. The JICA Master Plan shows a need for extensive development of generating capacity, both for base- and peak load, to meet forecast electricity demand for Myanmar by 2030.
- **Relevance**: Cumulative impacts increase as a direct function of the size of the project portfolio.
- **Indicator:** Annual Generation in kWh that can be reached in more than 90% of project lifetime .
- **Data availability**: Would require confirmed data of present and planned generation for existing generating plants, plants under construction and planned generating plants. Hydrological flow series are required.
- **Other comment**: The hydrological regime requires increased regulation to meet generating capacity during periods with low natural water flows.

Candidate VEC: Installed Capacity

- **Importance**: High for many reasons, from very short periods (grid stabilization) to longer periods with peak demand, especially if other renewable energy resources are to be used in the electricity generation mix
- **Relevance**: Cumulative impacts increase as a direct function of the size of the project portfolio.
- **Indicator:** MW.
- **Data availability**: Would require confirmed capacity information for hydropower plants under construction and for planned hydropower plants, as well as other types of renewables.

Candidate VEC: Investment Costs

- **Importance**: High.
- **Relevance**: Cumulative impacts increase as a direct function of the size of the project portfolio.
- **Indicator:** USD.
- **Data availability**: Would require confirmed data of costs for hydropower plants under construction and for planned hydropower plants.

Candidate VEC: Levelized Cost of Electricity (LCOE)

- **Importance**: High.
- **Relevance**: Influenced by the economic viability of the projects within the scenario.
- **Indicator:** Net Present Value of the unit cost of electricity over the lifetime of a generating asset (Usc/kWh).
- **Data availability**: Would require confirmed data of costs for hydropower plants under construction and for planned hydropower plants, as well as for unit costs for generating of alternative renewable power plants.

CANDIDATE VECs FROM RESEARCH TO DATE - ENVIRONMENT

Candidate VEC: Channel Stability

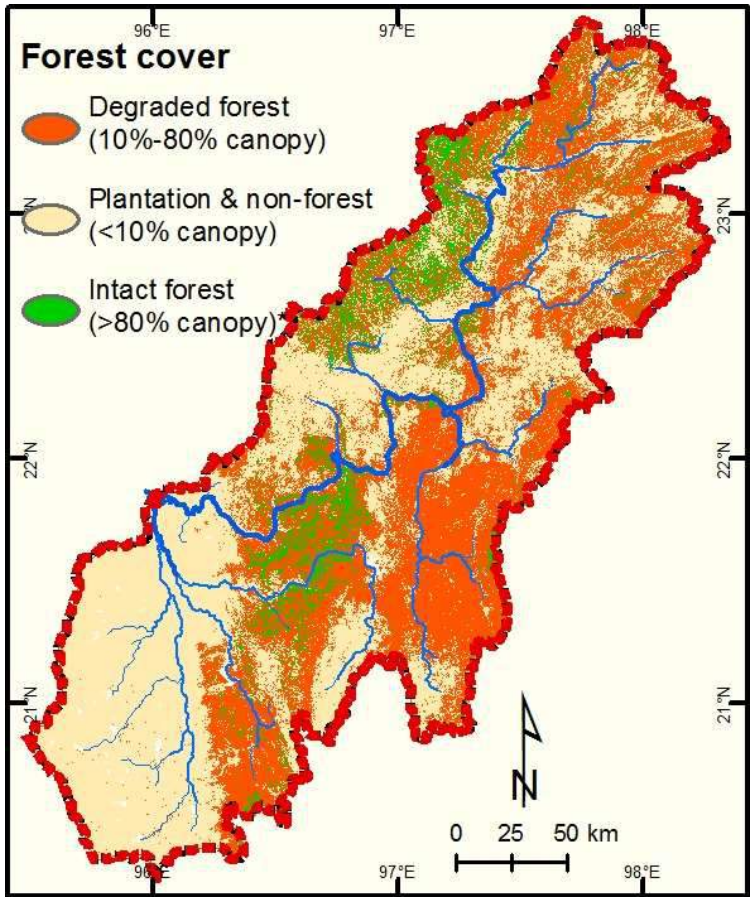
- **Importance**: Relevant to maintenance of aquatic habitats, maintenance of navigation channels, and floodplain agriculture. Myitnge exerts influence on Ayeyarwady channel stability as well
- **Relevance:** High relevance downstream of Yeywa where river is responding to altered flow and sediment starvation; relevant upstream of Yeywa where river connectivity remains high, lower relevance in Zawgyi where flow is regulated and large percentage of flow is distributed via channels
- **Data availability**: None. Would require geology/land use/slope/rainfall to be used as surrogate for sediment delivery and channel stability
- **Other comment**: Important attributes could be included in other VECs rather than independent VEC
  - Downstream of Yeywa, issues could be incorporated into public safety / public amenity
  - Sediment transport and channel changes could be reflected in changes to aquatic habitats

Candidate VEC: Availability of Aquatic Habitats

- **Importance**: Highly relevant to biodiversity given number of endemic and threatened species in Middle Ayeyarwady- fisheries and OAAs used as food source (but impacted by Yeywa)
- **Relevance**: High in Myitnge - Large reaches of rivers will be affected by proposed development plans and river connectivity will be decreased
- **Data availability**: Moderate - Would rely on similar methodology to SEA with types of river reaches used as input, along with Project Footprints
- **Other comment**: Might be able to be combined with availability of terrestrial habitats due to overlap of issues and input data available (e.g., percentage of river flowing through karst).

Candidate VEC: Availability of Terrestrial Habitats

- **Importance**: Highly relevant to biodiversity
- **Relevance**: Future developments will alter connectivity within the landscape, and potentially increase access to high value areas due to new access roads, transmission line corridors and impoundments
- **Data availability**: Moderate- Would rely on distribution of Intact Forests and KBAs and with Project Footprints, including transmission lines
- **Other comment**: Might be able to be combined with availability of aquatic habitats due to overlap of issues and input data available



CANDIDATE VECs FROM RESEARCH TO DATE – SOCIO-ECONOMICS

Candidate VEC: Local Economic Development

- **Importance**: High. There is an urgent need for improvement of livelihoods, especially in upper basin.
- **Relevance**: Hydropower and other renewable energy projects can contribute to local economic development through employment and procurement, roads, electrification, irrigation and other pathways.
- **Data availability**: Would require finding suitable indicators that can serve as a proxy for all positive impacts. A simple approach (such as 'number of people living within 2 km of project footprints') could be the best solution.
- **Other comment**: Depends strongly on project-level approaches (for example, local content in procurement). Could be broken down into its components.

Candidate VEC: Maintenance of Social Cohesion

- **Importance**: High. Social cohesion is an important value as it can help people cope with rapid change, avoid conflicts, and maintain ethnic identity and cultural diversity.
- **Relevance**: Hydropower and other renewable energy projects can reduce social cohesion by displacement (physical and economic), the dilution of ethnic identities, conflicts, health and safety risks, loss of aesthetic value/sense of place, and other pathways.
- **Data availability**: Would require finding suitable indicators that can serve as a proxy for all negative impacts. A simple approach (such as 'number of people living within 2 km of project footprints') could be the best solution.
- **Other comment**: Depends strongly on project-level approaches (for example, compensation for displacement). Could be broken down into its components.

Candidate VEC: Cultural Heritage

- **Importance**: Medium? Cultural heritage sites such as temples can be important components of cultural identity, and attract visitors.
- **Relevance**: Hydropower and other renewable energy projects can affect cultural heritage sites directly (e.g. by inundation, damages during construction) or indirectly (by changing their landscape context, accessibility etc.).
- **Data availability**: Depends on available registers of sites. If project footprints can be calculated, direct impacts are then easily shown. Indirect impacts require some discussion about distances and relevance.
- **Other comment**: Could be included under Social Cohesion.

Candidate VEC: Public Safety

- **Importance**: High? Depends on exposure of people downstream of dams.
- **Relevance**: Hydropower projects can influence downstream water levels through peaking operations and dam breaks, leading to a range of safety risks.
- **Data availability**: Would require a number of data on hazards, topography, populations and potentially, modelling of operations, wave propagation, inundation.
- **Other comment**: Depends strongly on assumptions about operations, construction quality, emergency preparedness etc.

Candidate VEC: Economic Values Downstream of Confluence with Ayeyarwady

- **Importance**: High. The Ayeyarwady is a crucial element of Myanmar's economy, influencing the livelihoods of millions of people.
- **Relevance**: Hydropower projects can have far-reaching downstream effects, such as loss of fisheries and land, gains in navigation, or flood control. However, the Myitnge basin provides only a relatively small contribution of flows, sediment, fish reproduction habitat, etc. of the overall basin.
- **Data availability**: Would require finding suitable indicators that can serve as a proxy for all impacts (some of which may be negative while others are positive). A possible solution is to only consider the changes at the confluence, with some assumptions about the downstream direction of change and importance, but without modelling.
- **Other comment**: Depends on spatial scope decisions and on assumptions about operations, mitigation options, etc.

EXPLANATION OF SMALL GROUP WORK ON VECs

Group Work on VECs

- **Part 1 – Review Lists of Candidate VECs** - What are values of very high importance in the Myitnge basin? (45 Minutes)
  - 3 groups, each group spends up to 15 minutes on each category (power systems, environment, socio-economics) identifying what values are of very high importance or significance for the Myitnge basin for that category
  - The table facilitator documents suggestions and provides 3 separate lists for candidate VECs (a list for each category)

- **Part 2 – Review and Prioritize Candidate VECs for CIA Analysis** (45 Minutes)
  - 3 tables, each with a focus on one category (power systems, environment, socio-economics), using the lists of candidate VECs from Part 1 for that category.
  - 30-minute discussion of (1) sensitivity of the candidate VECs to cumulative impacts from power developments; and (2) potential quantitative indicators for each candidate VEC
  - 15-minute consolidation of discussions and listing of prioritized candidate VECs

- **Part 3 – Report Back** (45 Minutes)
  - Each table reports to the plenary on the discussions and priorities for the candidate VECs for their respective category (15 minutes per category).

BREAK

SMALL GROUP WORK – ANALYSIS OF CANDIDATE VECs

Group Work on VECs

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LUNCH

REPORT BACK FROM SMALL GROUPS

Group Work on VECs

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Candidate VECs from Group Work: Power System

1) Firm Generation Capacity
2) Levelized Cost of Electricity (LCOE)
3) Generation Mix
4) Hydro & other renewable energy potential
5) Investment Costs

+

1) Transmission Line Network Capacity
2) Generation Capacity
3) Installed Capacity

Candidate VECs from Group Work: Environment

- Water Quality
- Aquatic Ecosystem
- Terrestrial Ecosystem
- Sediment Transport
- Water Level Fluctuation

Candidate VECs from Group Work: Socio-Economics

- Local Economic Development (through employment and procurement, status of roads network, electrification, irrigation)
- Maintenance of Social Cohesion (threatened by displacement, dilution of ethnic identities, conflicts, health and safety risks, loss of aesthetic value/sense of place)
- Cultural Heritage Sites
- Public Safety (downstream water levels)
- Economic Values Downstream of Confluence with Ayeyarwady (loss of fisheries and land, gains in navigation and flood control)

DISCUSSION ON VECs

REVIEW OF CIA SCOPING OPTIONS AND KEY MESSAGES FROM THE WORKSHOP

MYITNGE CIA NEXT STEPS

Project Stages and Timing

Stage 1 –
Background Information

Stage 2 –
State of the Myitnge Basin

Mobilization visit – 7-22 Jan 2019 – Yangon and NPT

Stage 3 –
CIA Scoping

Discussed at Inception Workshop – 13-14 Feb 2019 - NPT

Stage 4 –
Base Case Cumulative Impact Analyses

Discussed at Interim Workshop – 24-25 Apr 2019 - Mandalay

Stage 5 –
Alternative Scenarios Cumulative Impact Analyses

Discussed at Integrated CIA Workshop – 2-3 Jul 2019 - NPT

Stage 6 –
Basin Management

Presented at Basin Management Workshops – 20 and 22 Aug 2019 - Lashio and Mandalay

Project Finalization – Final Project Workshop – 18-19 Sep 2019 - NPT

CLOSING REMARKS

REFRESHMENTS AND CLOSE OF WORKSHOP