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# SOBA 6: AYEYARWADY RIVER BASIN COMMUNITIES ATLAS

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AYEYARWADY STATE OF THE  
BASIN ASSESSMENT (SOBA)

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Status: FINAL

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(EMC)

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**Disclaimer**

*"The Ayeyarwady State of the Basin Assessment (SOBA) study is conducted within the political boundary of Myanmar, where more than 93% of the Basin is situated."*

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## FOREWORD

This *Ayeyarwady River Basin Communities Atlas* (Communities Atlas) has been developed in the framework of the *State of the Basin Assessment (SOBA)* as part of the Ayeyarwady Integrated River Basin Management Project (AIRBMP). This project is initiated by the government of the Republic of Union of Myanmar and funded by a World Bank loan. The Ministry of Transport and Communication, via the Directorate of Water Resources and Improvement of River Systems, is Myanmar's focal ministry. The project is managed by the Project Management Unit of AIRBMP.

The Communities Atlas is an additional document to the SOBA 6 Report. The Atlas aims to summarize, visualize, and share the voices of the people of Myanmar. Community consultation sessions took place in 14 townships and over 30 villages. The villagers living in the Ayeyarwady River Basin shared their concerns, their water values, and their future aspirations. All are shown by means of quotes, pictures, maps, and graphs in this Atlas.

### **“Step by Step Together”**

Involvement of communities and other stakeholders is crucial for successful development and implementation of the future Integrated Ayeyarwady River Basin Masterplan. A step-by-step process of mutual understanding and support will result in the safe, prosperous, and sustainable masterplan for the Ayeyarwady River Basin in the long term, one that will be supported and appreciated by many.

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The Communities Atlas can be considered as a visual, easy-to-understand and comprehensive mapping communication tool about the communities, prepared to inform policy makers, decision-makers, and the communities themselves.

All villages (over 30) are located in different townships (14) which are located in different hydro-ecological zones (5) in the Ayeyarwady River Basin. The structure of the atlas is in line with these zones, focusing in particular on the village level. Each village profile contains two pages with the key information, personal quotes, and relevant pictures.

The Communities Atlas:

- Provides a comprehensive overview that can be used for data search and checking in the future;
- Shows the relation and integration between different townships; and
- Enables communication about the voices of the people.

This Communities Atlas is not a scientific report. Having this in mind, a lot of qualitative data has been collected of which some have been quantified in graphs and maps to show the largest differences between villages and townships. The quantity of data gathered, and the way the data were gathered and interpreted make this qualitative research.

The Communities Atlas is considered a living document that can be updated or extended to include more villages and details by the Myanmar government in the future. In addition, the Communities Atlas includes expected and observed trends of development, which can help decision-makers in compiling their policy plans under the uncertain future development. We truly hope that by reading and understanding the Communities Atlas, a shift in thinking will occur with regard to a top-down versus bottom-up approach in planning and decision-making.

## ACKNOWLEDGEMENTS

We gratefully thank our partners and supporters from the National Water Resources Committee (NWRC) and the NWRC Secretariat via Directorate of Water Resources and Improvement of River Systems (DWIR), Ministry of Transport and Communication, the Project Management Unit and advisors for the Ayeyarwady Integrated River Basin Management Project, the team of the Hydro-Informatics Centre and the Young Water Professionals.



We gratefully acknowledge the generous support and participation of the Myanmar Government via the General Administration Departments and villages; Nyaungdon Thaug Tan, Nyaungdon- Town Nyaungdon, Pathein 9th ward, Pathein Kan ni, Pathein Ma Ya Chaung, Labutta 1st ward, Labutta Kyauk Phuy, Labutta La Put Ta Louk, Hinthada Phaung Chaung, Hinthada Pa Khan, Pakkoku Kyun Nyo Nyi, Pakkoku Kyat Tan Kone, Nyaung U Kya Oo, Nyaung U Number 1 Ward, Magway Migyaungye, Magway Mean La Taung, Pyay Kone tharlin, Pyay nawin Quarter, Mandalay Shan Kalay Kyun, Mandalay South Seth Yeik, Mandalay Tha Yet Ta Pin, Kalay Hlaing Taryar, Kalay Ngar Hpar, Kalay Insein, Monywa Panpeaton Sith Pin Ward, Monywa Shwe Pyi Aye Ward, Singu Khuu Lae, Singu Nga Pyin Inn, Singu Number 2 Ward, Myitkhina Arlan, Myithina Naung Nan and Myitkhina Shitharpu.

We would like to thank all the authors who contributed in the development of the *Ayeyarwady River Basin Communities Atlas for the State of the Basin Assessment*. In particular, we thank:

Ms. Martine Leewis, Mr. Jasper van der Werff, Ms. Tanya Huizer, Ms. Catharien Terwisscha van Scheltinga, Mr. Johannes de Groot, Mr. Zin Thaw Oo, Ms. Judith Klostermann, Dr. Win Maung, Ms. Thida Nyein, Ms. Ei Ei Myo, Ms. Khin Ohn Mar Htwe, Ms. Phyo Thaw Thaw Htun, Mr. Pascal Weidema, Mr. Rob Steijn, Ms. Judit Snethlage, Ye Htut Aung, Linn Htet Aung, Mr. Phyo Wai Yan Paing, and Mr. Os Khai.

Furthermore, we would like to thank all others for their input and suggestions to improve this document.





## INTRODUCTION

Myanmar is favorably situated with abundant natural resources, including land and water, which are poised for rapid development in the coming years and decades. The Myanmar government has received a World Bank Credit for the Ayeyarwady Integrated River Basin Management Project (AIRBMP), managed by the Directorate of Water Resources and Improvement of River Systems (DWIR) of the Ministry of Transport and Communications (MoTC). The objective of the project is to help Myanmar develop the institutions and tools needed to enable informed decision making in the management of Myanmar’s national water resources and to implement integrated river basin management for the Ayeyarwady. The main elements in the Ayeyarwady river basin development planning process include the *State of the Basin Assessment* (SOBA). This will be a major technical product of the AIRBMP representing a comprehensive integrated environmental, social, and economic baseline for the Ayeyarwady River to-date. The SOBA Report will highlight issues, opportunities, risks, trade-offs, and uncertainties, which will need to be addressed in the basin master planning process. To develop the SOBA Report, the AIRBMP Project Management Unit (PMU) subcontracted six technical packages to cover a specific scope. One of the packages covers ‘Participatory 3D Mapping (P3DM) and local consultations’ (SOBA-6) to achieve the following objectives:

1. Development of a 3D relief model of the Ayeyarwady river basin.
2. Design and implement a public, multi-stakeholder consultation process which uses the 3D relief model and maps to take stock of the cultural, ecological, social, and livelihood assets, as well as issues of the river basin that are of priority interest to local communities.

In this *Ayeyarwady River Basin Community Atlas* (Community Atlas), we structured the collected issues, values, and other details from villagers in the Ayeyarwady River Basin scale via the hydro-ecological zones (HEZs) to the village-level.



Figure 1 – Impression of a community session

# 1 AYEYARWADY RIVER BASIN

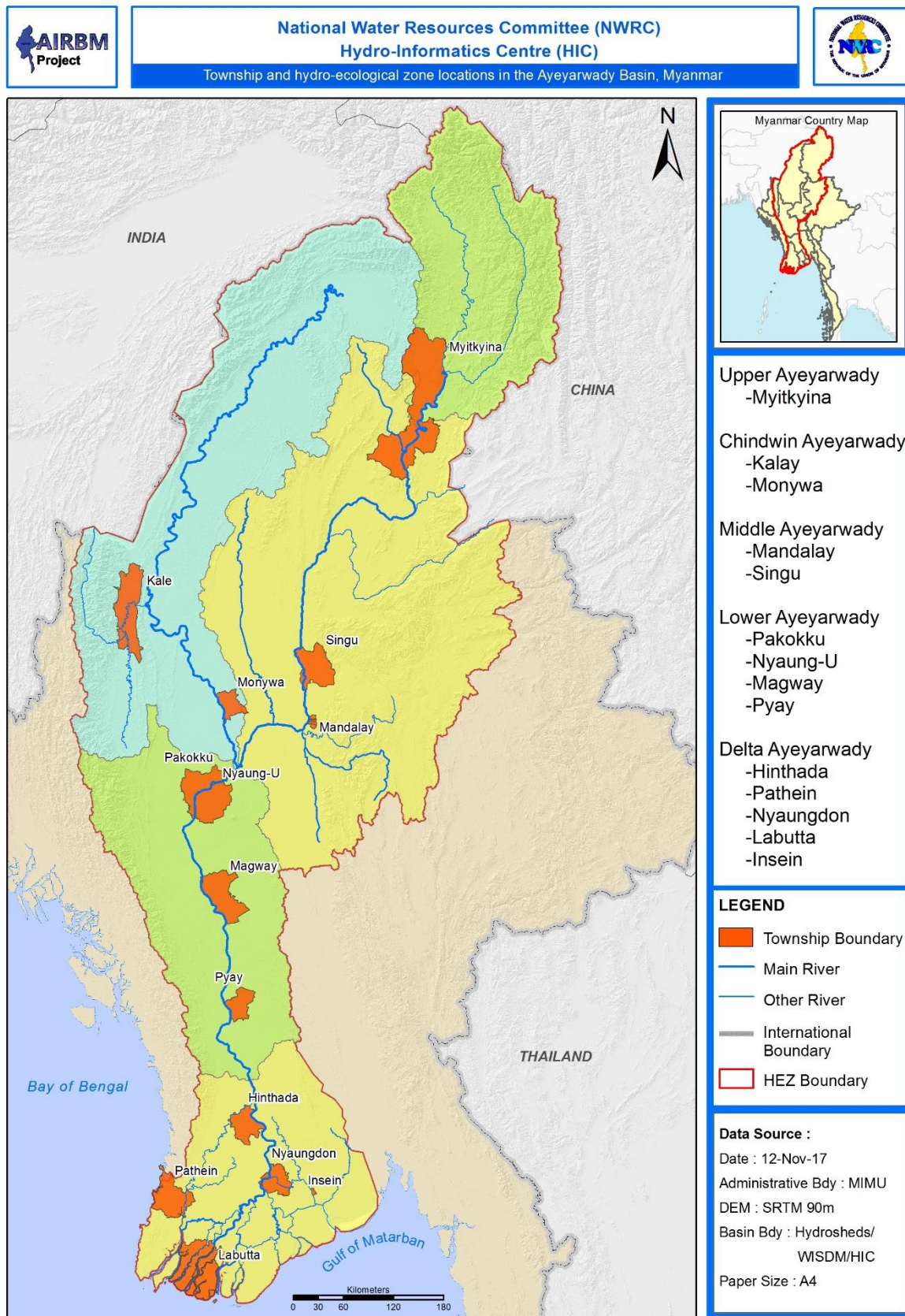


Figure 2 - Consulted townships in the Ayeyarwady River Basin



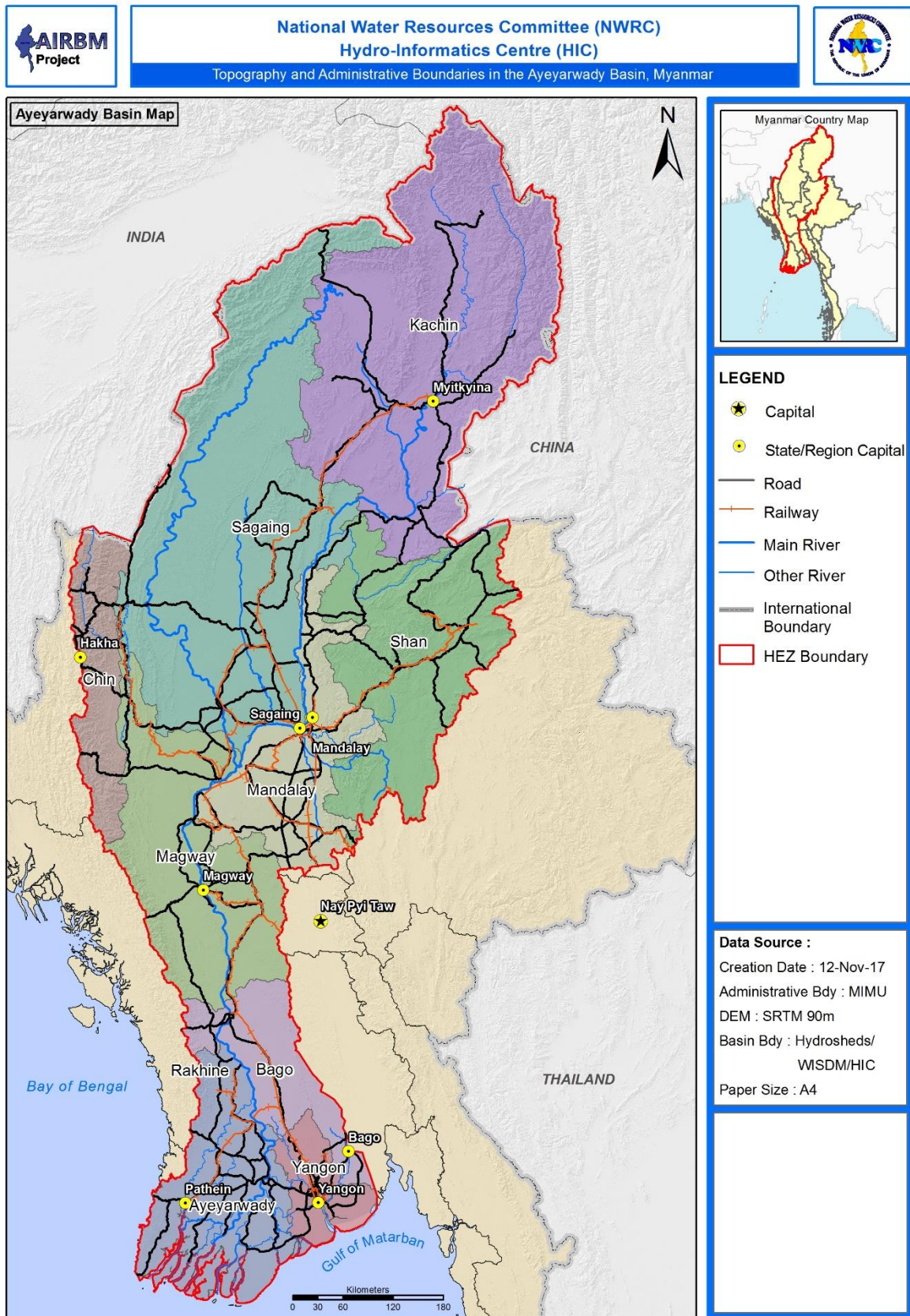


Figure 3 - Topographic map and administrative boundaries



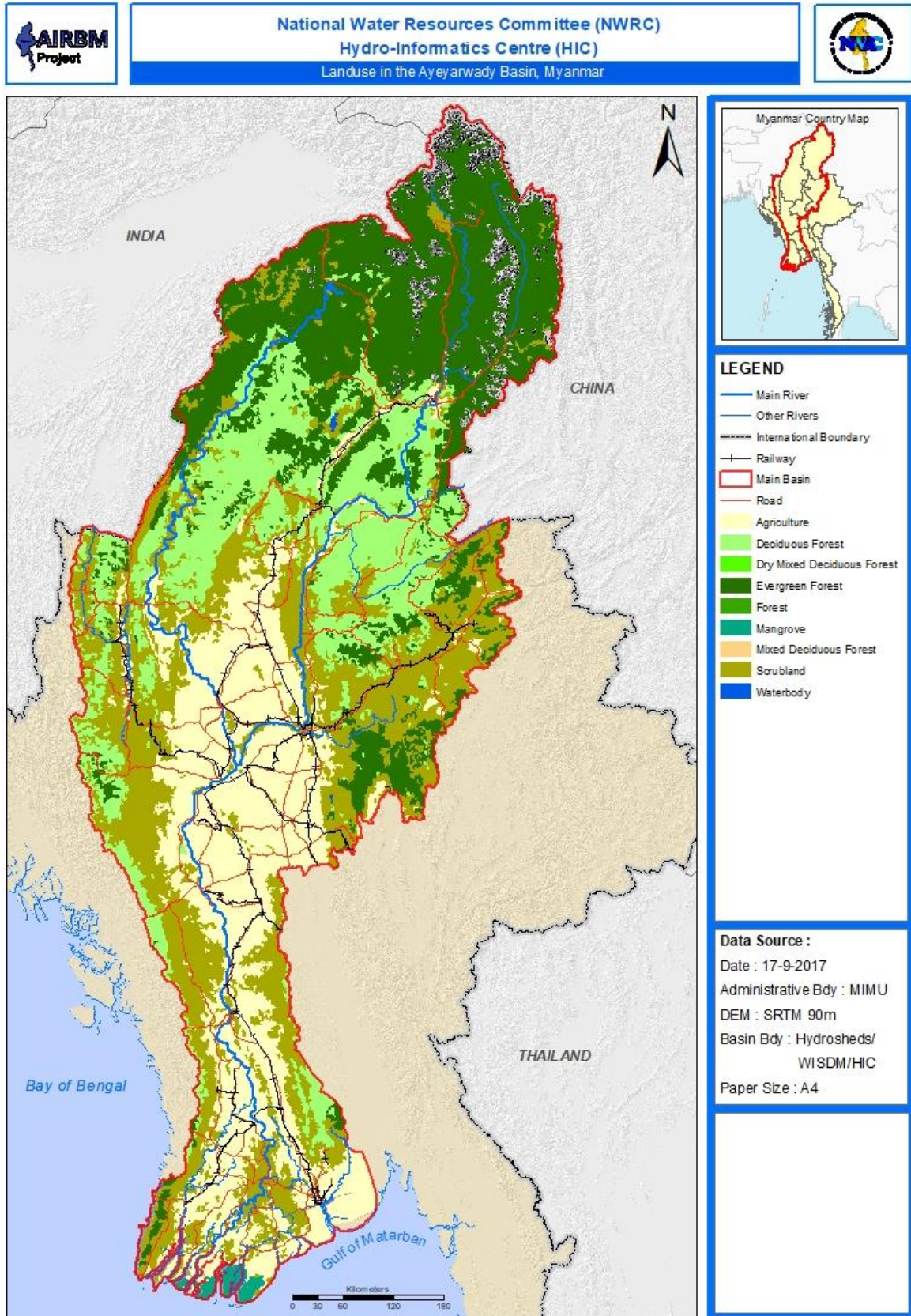


Figure 4 - Land use in the Ayeyarwady River Basin



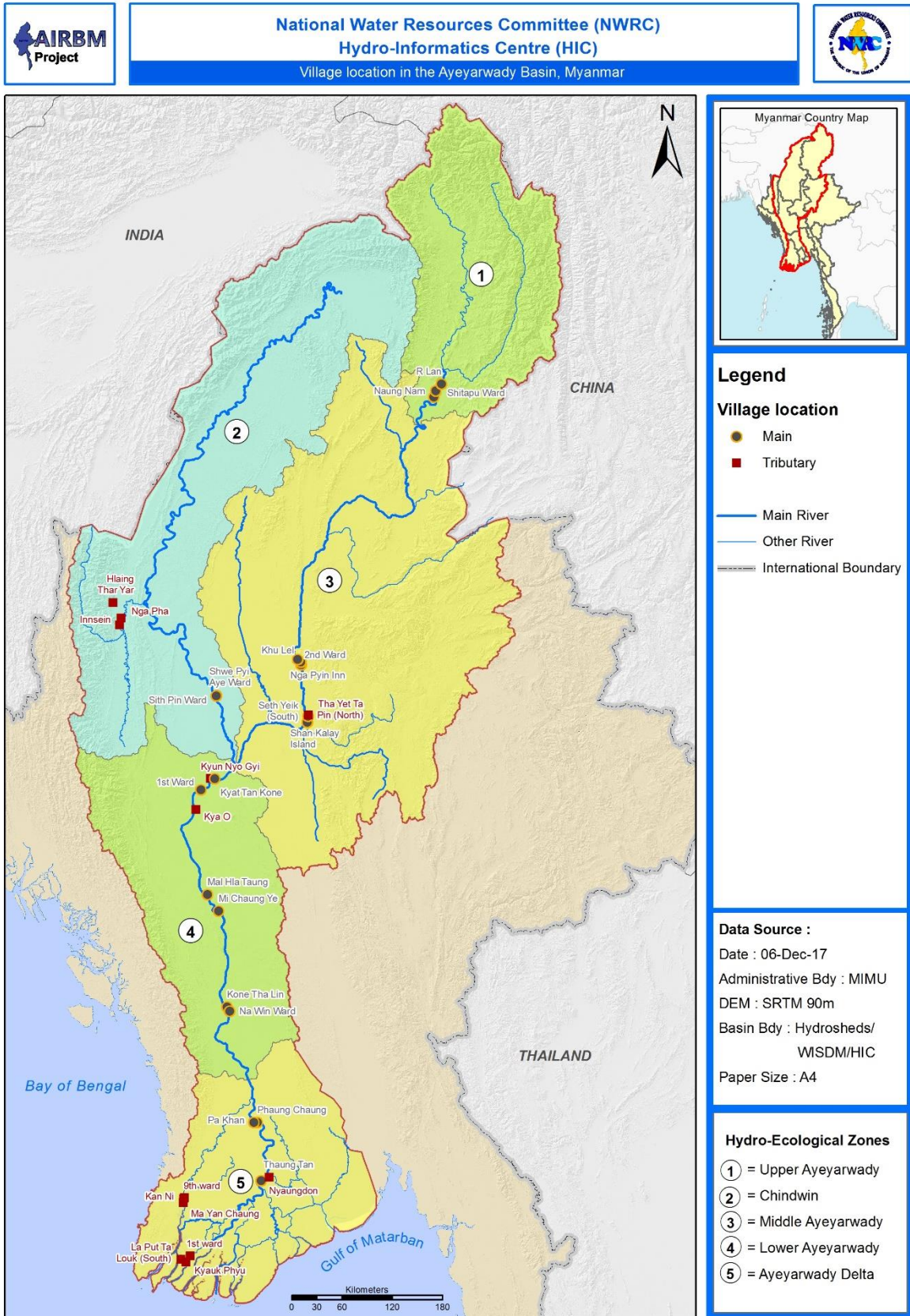


Figure 5 – Village along the main river (orange/black) and villages located along a tributary of the main river (red)

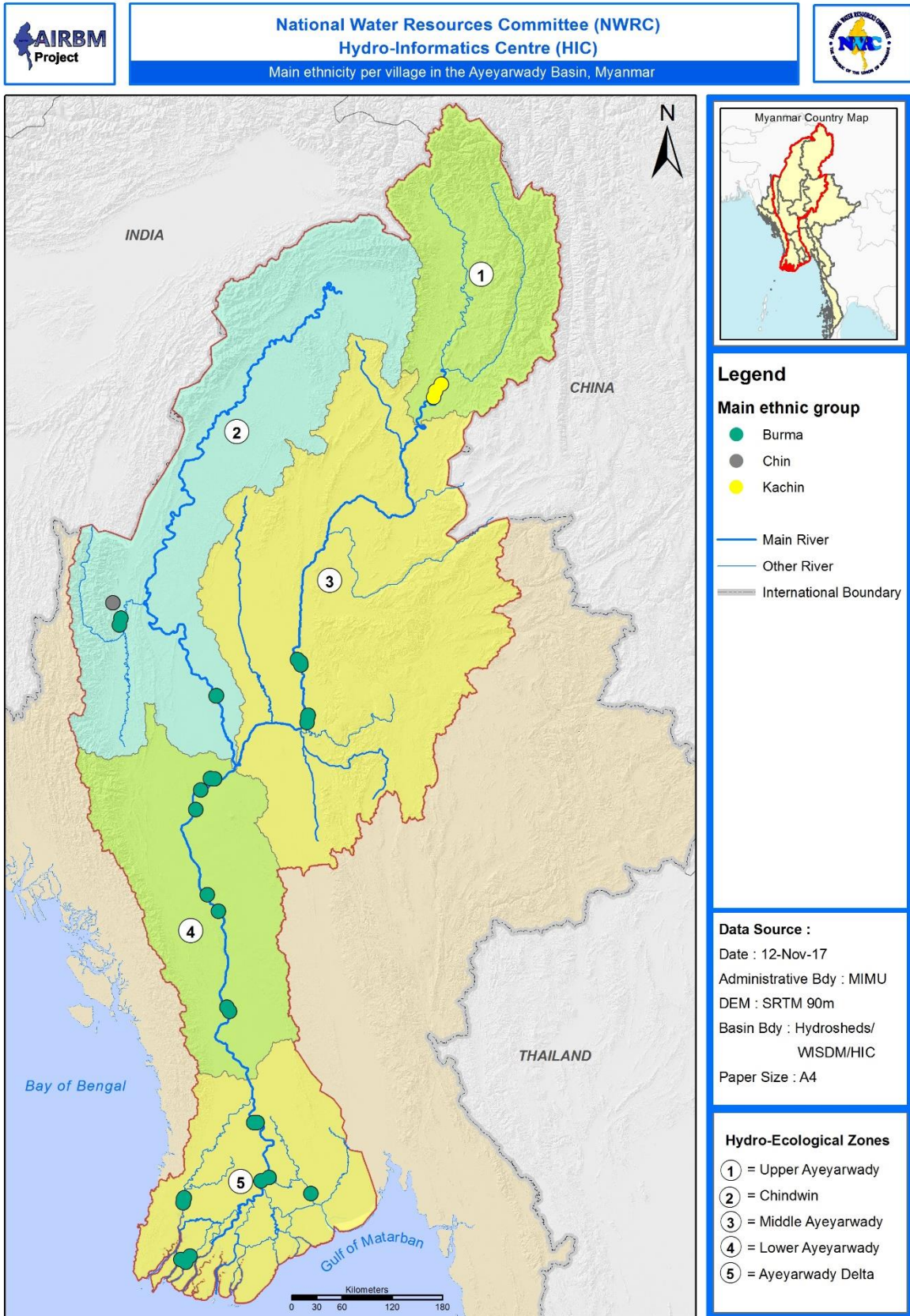


Figure 6 - Main ethnicity per consulted village



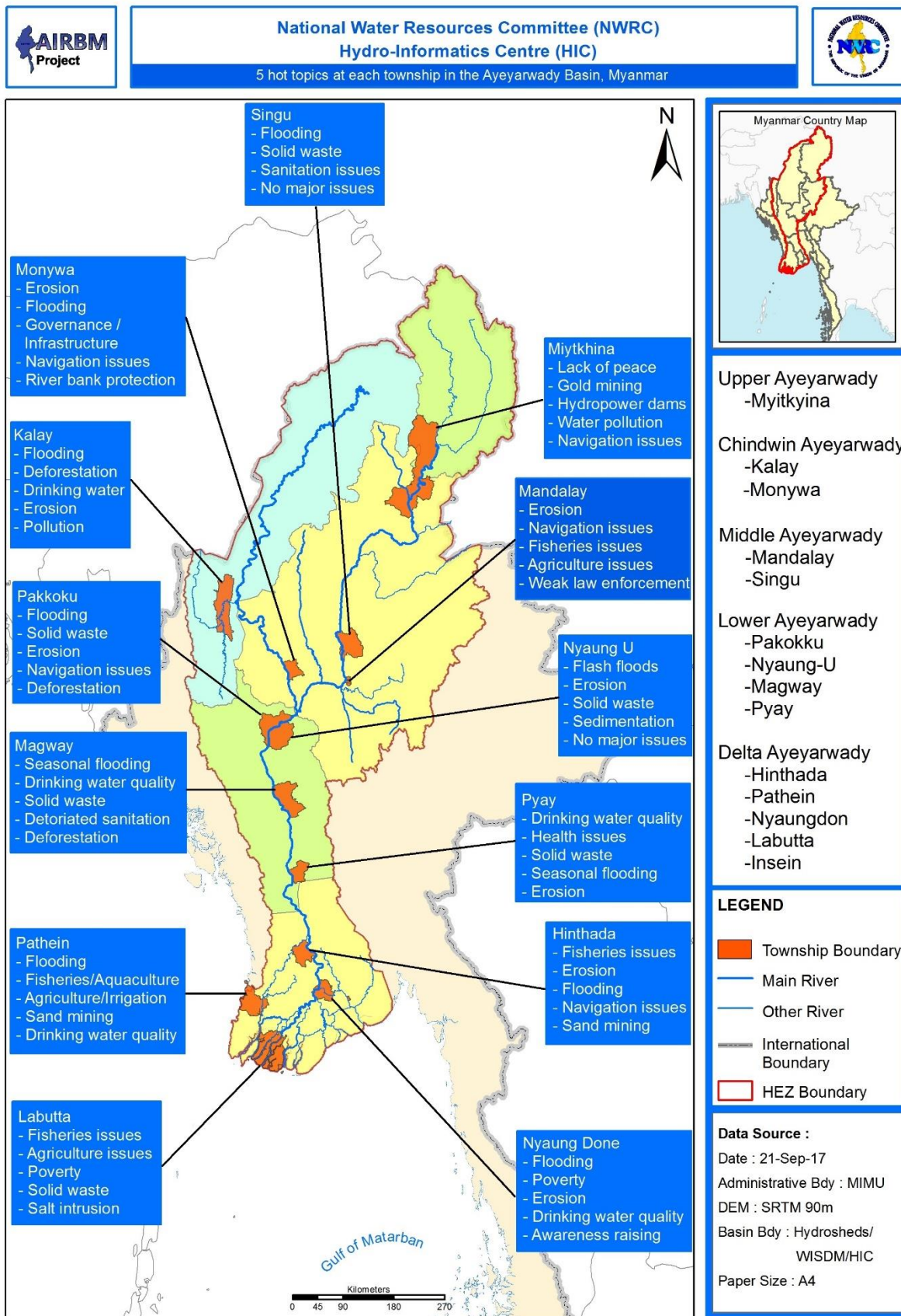


Figure 7 - Top 5 issues of concern voiced by each consulted township in the Ayeyarwady River Basin (expert judgement)

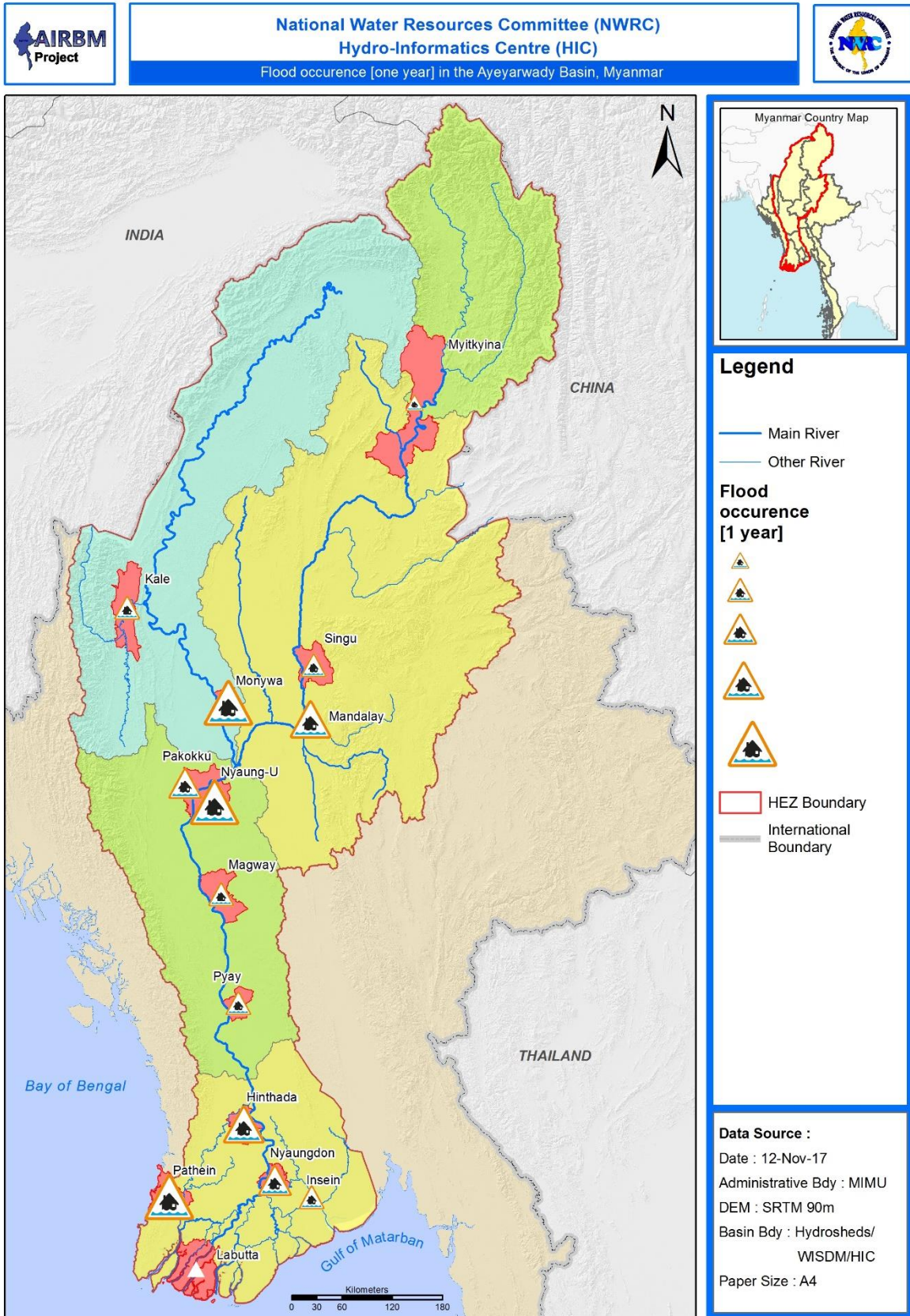


Figure 8 - Flood occurrence (1 year), as indicated by villagers per township



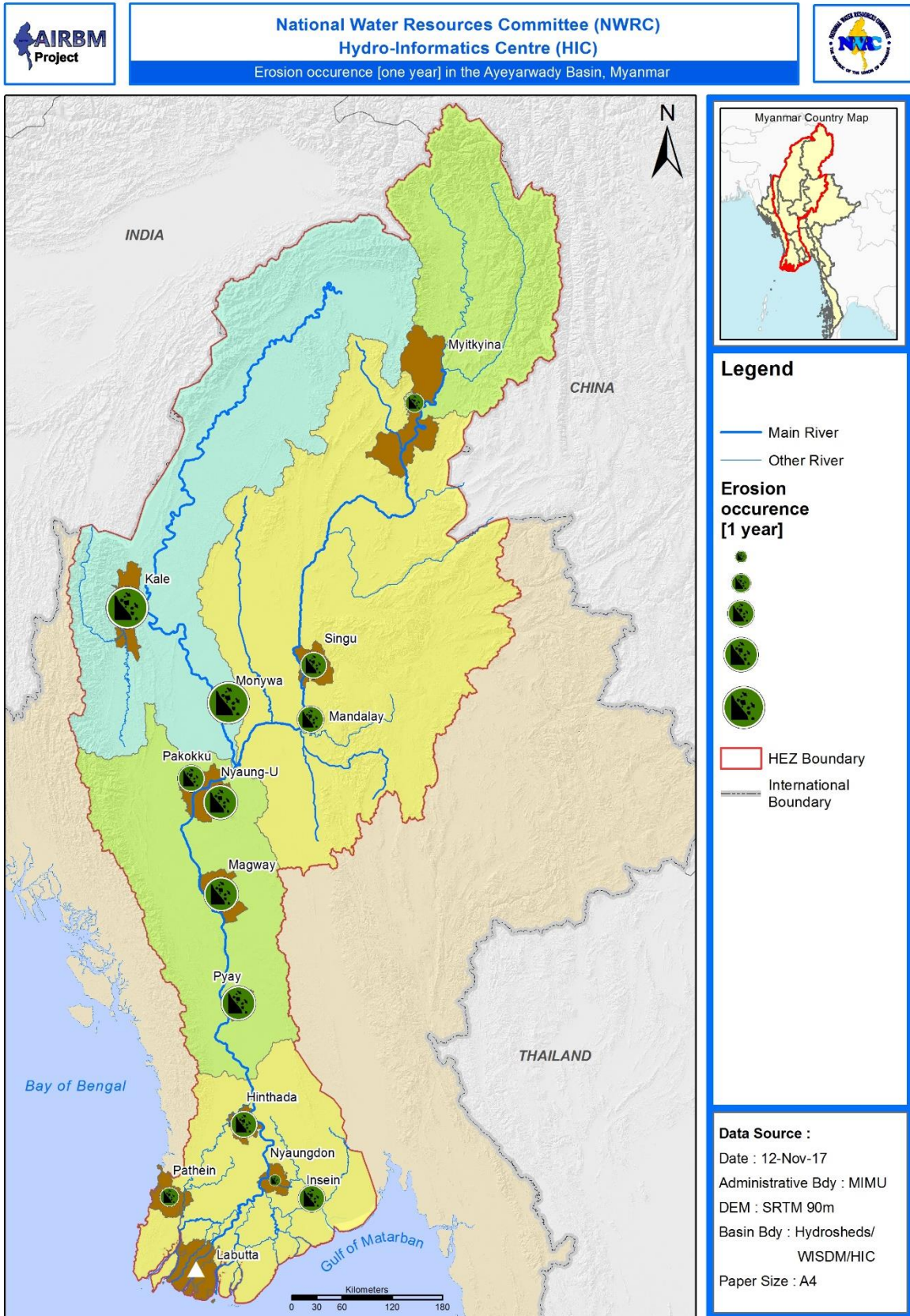


Figure 9 - Erosion occurrence (1 year), as indicated by villagers in the townships

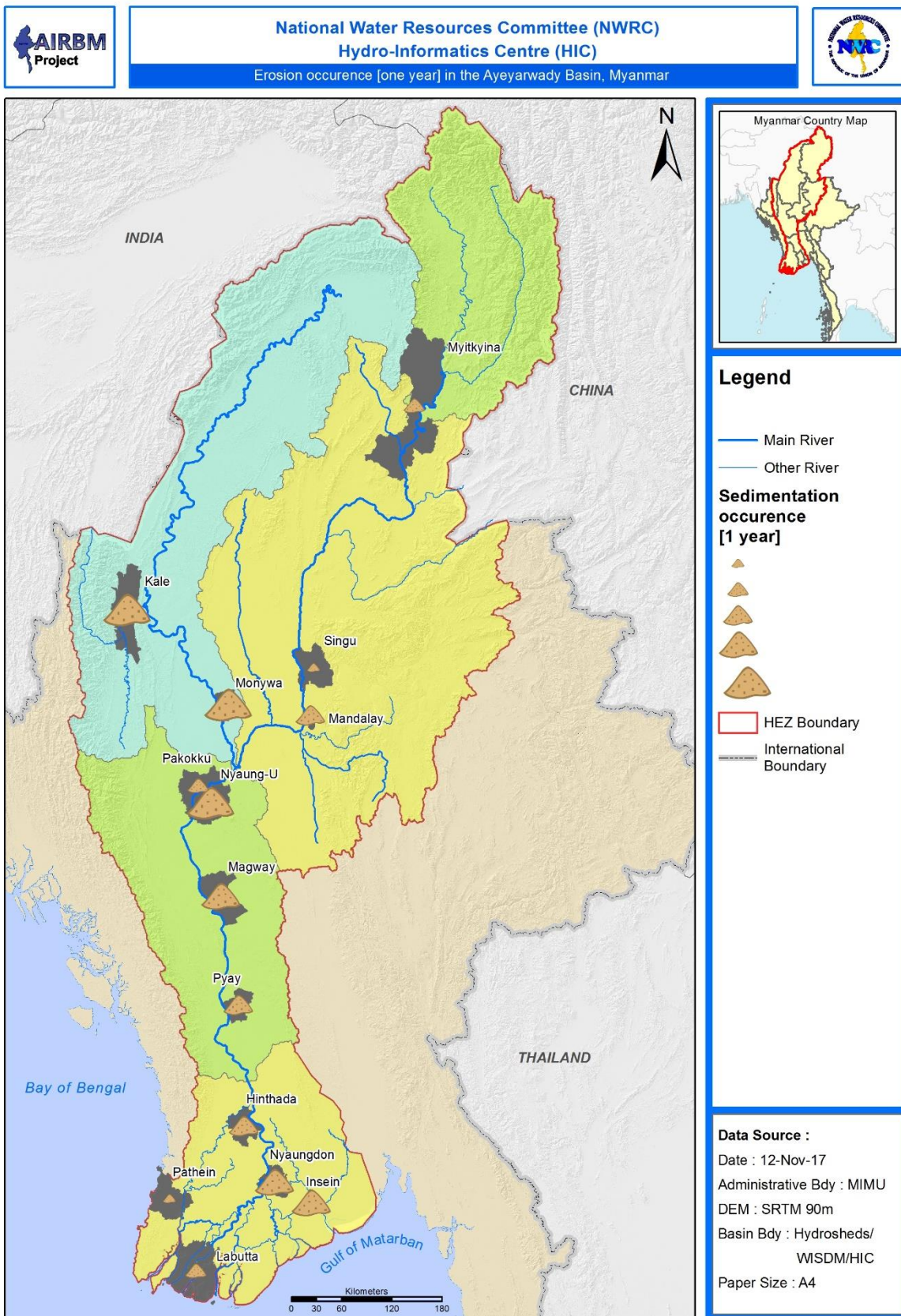


Figure 10 - Sedimentation (1 year), as indicated by villagers per township



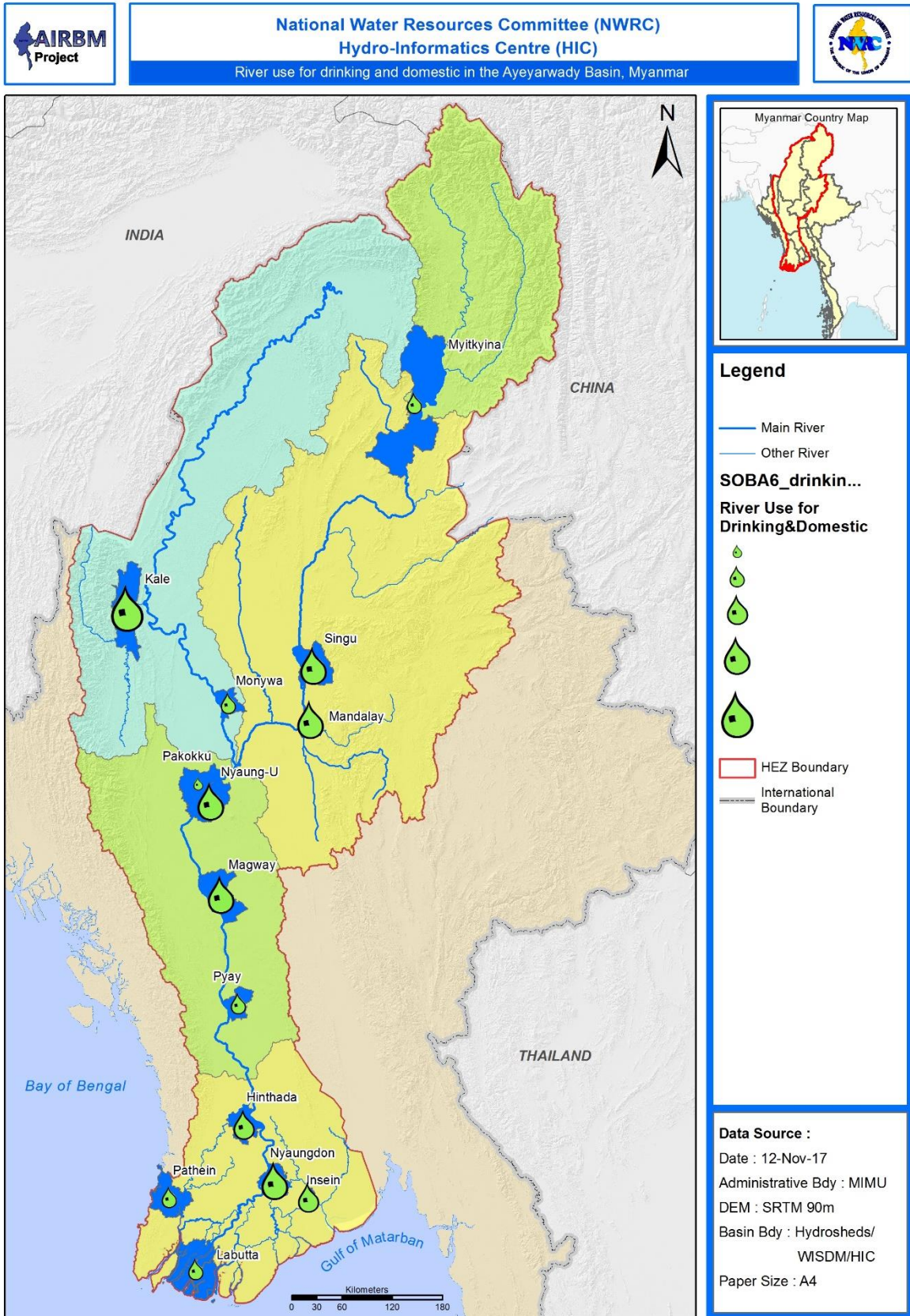


Figure 11 - River use for domestic and drinking water supply, as indicated by villagers per township

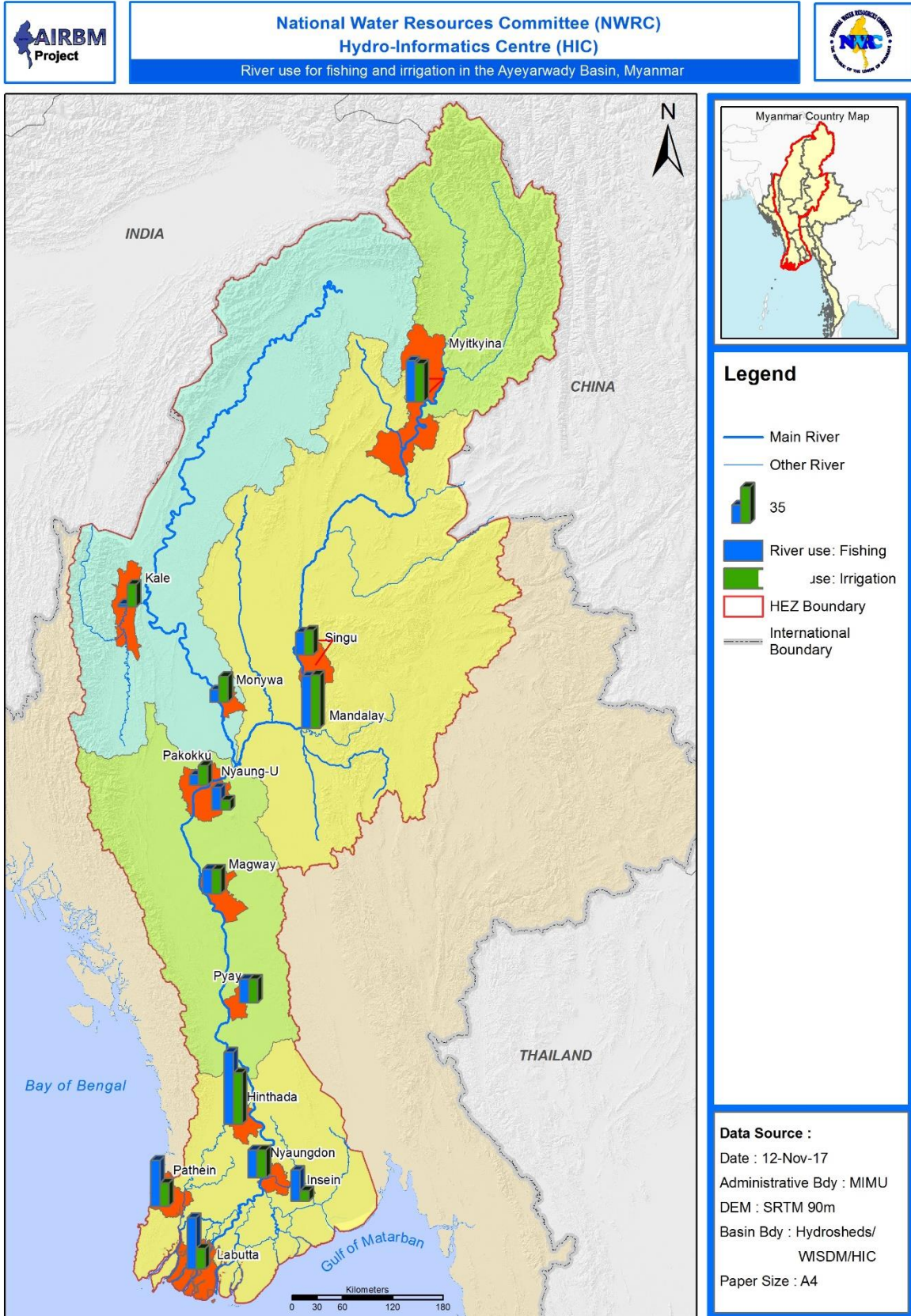


Figure 12 - Fishing and irrigation use of the river, as indicated by villagers per township



NATIONAL WATER RESOURCES COMMITTEE (NWRC) | AYEYARWADY STATE OF THE BASIN ASSESSMENT (SOBA)  
 AYEYARWADY RIVER BASIN COMMUNITIES ATLAS

Table 1 – Problems and trends voiced by villagers during discussions

HEZ	Township	Village	Sanitation	Drinking water from river	Solid waste	Hard infrastructure	Resilience	Governance	Pollution	Fisheries	Erosion	Deforestation	Flooding	Irrigation	Sedimentation	
Upper Basin	Myitkyina	R Lan			↑				⊗	↓	↑	↑	↑			
		Naung Nam			↑	↑			⊗	↓	↑					
		Shitapu Ward		↓	↑	↑			⊗							
Chindwin Basin	Kale	Innsein									⊗	↑	⊗	↓		
		Nga Pha		⊗												
		Hlaing Thar Yar		⊗	↑							⊗	↑	⊗	↓	
	Monywa	Shwe Pyi Aye Ward			P			P				↑	⊗			
Sith Pin Ward						↑					⊗		⊗			
Middle Basin	Singu	Khu Lel		↓	P					↓			⊗			
		Nga Pyin Inn	P	⊗						↓			⊗	↓		
		2nd Ward		↓							P		P			
	Mandalay	Shan Kalay Island			↑			P			⊗				↑	
		Tha Yet Ta Pin (North)						P		↓				⊗		
		Seth Yeik (South)		⊗	P		P		↓							
Lower Basin	Magway	Mal Hla Taung	P		P			⊗	P		↑		P			
		Mi Chaung Ye	↓	↓	P					↓		P	⊗			
	Nyaung-U	Kya O				P	⊗			↓			⊗			
		1st Ward (Nyaung-U)			⊗				⊗					⊗		↑
	Pakokku	Kyun Nyo Gyi						P		↑			⊗			
		Kyat Tan Kone			↑		↓		↑		↑		⊗			
	Pyay	Kone Tha Lin		⊗	↑				↑		↑			P		
Na Win Ward			⊗	↑			↓		↓	↑			P			
Delta Basin	Hinthada	Pa Khan									↑		P		⊗	
		Phaung Chaung		⊗	↑			⊗		⊗	P		P			
	Labutta	Kyauk Phyu			⊗					↓		↑			⊗	
		1st ward (Labutta)		↓	↑			⊗								
		La Put Ta Louk (South)			↑					↓	↑				↓	↑
	Nyaungdon	Nyaungdon		↓							⊗		↑		⊗	
		Thaung Tan										↑	↑			
	Pathein	Kan Ni				↑				⊗	↑		↑			
Ma Yan Chaung					⊗		⊗		⊗				P	↓	↑	
9th ward				P			⊗						↑			

↓ = decline ↑ = increase P = mentioned as problem ⊗ = key issue of concern

Table 2 – Relative importance of the problems indicated by the villagers

HEZ	Township	Village	Solid waste	Pollution	Erosion	Flooding	Conflict
Upper Basin	Myitkyina	R Lan	Orange	Yellow	Yellow	Green	Green
		Naung Nam	Orange	Yellow	Orange	Yellow	Green
		Shitapu Ward	Orange	Yellow	Orange	Orange	Yellow
Chindwin Basin	Kale	Innsein	Yellow	Yellow	Orange	Red	Green
		Nga Pha	Yellow	Green	Orange	Orange	Yellow
		Hlaing Thar Yar	Orange	Orange	Orange	Orange	Green
	Monywa	Shwe Pyi Aye Ward	Orange	Yellow	Yellow	Red	Green
		Sith Pin Ward	Green	Green	Red	Orange	Green
Middle Basin	Singu	Khu Lel	Orange	Orange	Yellow	Orange	Green
		Nga Pyin Inn	Orange	Orange	Orange	Orange	Green
		2nd Ward	Orange	Orange	Yellow	Orange	Yellow
	Mandalay	Shan Kalay Island	Yellow	Yellow	Red	Yellow	Green
		Tha Yet Ta Pin (North)	Orange	Green	Green	Red	Green
		Seth Yeik (South)	Yellow	Yellow	Red	Yellow	Green
Lower Basin	Magway	Mal Hla Taung	Orange	Orange	Yellow	Orange	Green
		Mi Chaung Ye	Yellow	Orange	Orange	Yellow	Green
	Nyaung-U	Kya O	Green	Green	Orange	Red	Green
		1st Ward (Nyaung-U)	Orange	Orange	Orange	Orange	Green
	Pakokku	Kyun Nyo Gyi	Green	Green	Red	Orange	Green
		Kyat Tan Kone	Green	Yellow	Orange	Orange	Green
	Pyay	Kone Tha Lin	Orange	Yellow	Yellow	Orange	Green
Na Win Ward		Orange	Yellow	Red	Orange	Green	
Delta Basin	Hinthada	Pa Khan	Green	Green	Orange	Red	Green
		Phaung Chaung	Green	Green	Orange	Orange	Green
	Labutta	Kyauk Phyu	Orange	Orange	Orange	Orange	Green
		1st ward (Labutta)	Orange	Orange	Green	Orange	Green
		La Put Ta Louk (South)	Orange	Orange	Yellow	Yellow	Green
	Nyaungdon	Nyaungdon	Orange	Yellow	Orange	Orange	Green
		Thaung Tan	Green	Yellow	Red	Orange	Green
	Pathein	Kan Ni	Yellow	Yellow	Red	Orange	Green
		Ma Yan Chaung	Green	Orange	Orange	Red	Green
		9th ward	Orange	Yellow	Green	Red	Green

Notes: green = not important; yellow = a little important; orange = important; red = very important

Table 3 – Relative importance of values, as indicated by villagers

Basin	Township	Village	Aquatic ecosystem	Irrigation	Sanitation	Fisheries	Aquaculture	Navigation	Recreation	Hydro-power	Good governance	Resilience	Drinking water	Industrial use	Social, culture & religious	
Upper Basin	Myitkyina	R Lan	Green	Grey	Grey	Green	Grey	Green	Blue	Grey	Blue	Grey	Blue	Grey	Grey	
		Naung Nam	Green	Grey	Grey	Blue	Grey	Green	Blue	Grey	Grey	Grey	Blue	Grey	Grey	
		Shitapu Ward	Blue	Grey	Grey	Grey	Grey	Blue	Blue	Grey	Grey	Grey	Blue	Green	Grey	Blue
Chindwin Basin	Kale	Innsein	Grey	Green	Grey	Green	Grey	Blue	Grey	Grey	Grey	Green	Green	Grey	Grey	
		Nga Pha	Grey	Green	Grey	Blue	Grey	Green	Grey	Grey	Grey	Green	Green	Grey	Grey	
		Hlaing Thar Yar	Grey	Green	Grey	Blue	Grey	Blue	Grey	Grey	Blue	Grey	Green	Green	Grey	
	Monywa	Shwe Pyi Aye Ward	Grey	Grey	Grey	Blue	Grey	Green	Blue	Grey	Green	Grey	Blue	Green	Grey	Grey
		Sith Pin Ward	Grey	Grey	Grey	Blue	Grey	Green	Blue	Grey	Grey	Blue	Green	Green	Grey	Grey
Middle Basin	Singu	Khu Lel	Grey	Green	Grey	Green	Grey	Blue	Grey	Grey	Grey	Blue	Green	Grey	Blue	
		Nga Pyin Inn	Grey	Blue	Grey	Blue	Grey	Blue	Grey	Blue	Grey	Grey	Blue	Green	Grey	Grey
		2nd Ward	Grey	Blue	Grey	Green	Grey	Blue	Grey	Blue	Grey	Grey	Blue	Green	Grey	Grey
	Mandalay	Shan Kalay Island	Grey	Blue	Grey	Blue	Grey	Blue	Grey	Blue	Grey	Blue	Grey	Blue	Grey	Grey
		Tha Yet Ta Pin (North)	Blue	Grey	Grey	Green	Grey	Blue	Grey	Blue	Grey	Grey	Blue	Blue	Grey	Grey
		Seth Yeik (South)	Blue	Grey	Grey	Blue	Grey	Blue	Grey	Blue	Grey	Grey	Blue	Blue	Grey	Grey
Lower Basin	Magway	Mal Hla Taung	Grey	Blue	Grey	Blue	Grey	Green	Grey	Grey	Grey	Blue	Green	Grey	Grey	
		Mi Chaung Ye	Grey	Blue	Green	Blue	Grey	Blue	Grey	Grey	Grey	Blue	Green	Blue	Grey	
	Nyaung-U	Kya O	Grey	Green	Grey	Green	Grey	Green	Grey	Grey	Grey	Grey	Blue	Green	Grey	Grey
		1st Ward (Nyaung-U)	Grey	Blue	Grey	Blue	Grey	Blue	Grey	Grey	Grey	Blue	Blue	Green	Grey	Grey
	Pakokku	Kyun Nyo Gyi	Grey	Green	Grey	Blue	Grey	Blue	Grey	Grey	Grey	Grey	Blue	Blue	Grey	Grey
		Kyat Tan Kone	Grey	Green	Green	Blue	Grey	Blue	Grey	Grey	Grey	Grey	Blue	Blue	Grey	Grey
	Pyay	Kone Tha Lin	Grey	Blue	Grey	Blue	Grey	Blue	Grey	Grey	Grey	Grey	Blue	Green	Grey	Blue
		Na Win Ward	Grey	Blue	Grey	Blue	Grey	Blue	Grey	Grey	Grey	Grey	Blue	Green	Grey	Blue
Delta Basin	Hinthada	Pa Khan	Grey	Grey	Grey	Green	Grey	Green	Grey	Grey	Blue	Grey	Blue	Grey	Grey	
		Phaung Chaung	Grey	Blue	Grey	Green	Grey	Green	Grey	Grey	Grey	Blue	Green	Blue	Grey	
	Labutta	Kyauk Phyu	Grey	Green	Grey	Blue	Grey	Blue	Grey	Grey	Grey	Grey	Blue	Blue	Grey	Grey
		1st ward (Labutta)	Grey	Blue	Grey	Blue	Grey	Blue	Grey	Grey	Grey	Grey	Blue	Blue	Grey	Grey
		La Put Ta Louk (South)	Grey	Green	Grey	Green	Grey	Blue	Grey	Grey	Grey	Grey	Blue	Blue	Grey	Grey
	Nyaungdon	Nyaungdon	Blue	Blue	Grey	Blue	Grey	Blue	Grey	Grey	Green	Grey	Blue	Green	Grey	Grey
		Thaung Tan	Blue	Blue	Grey	Blue	Grey	Blue	Grey	Grey	Blue	Grey	Blue	Blue	Grey	Grey
	Pathein	Kan Ni	Blue	Green	Grey	Green	Grey	Blue	Grey	Grey	Grey	Grey	Blue	Blue	Grey	Grey
		Ma Yan Chaung	Blue	Green	Blue	Green	Grey	Blue	Grey	Grey	Grey	Grey	Blue	Blue	Grey	Grey
9th ward		Grey	Blue	Grey	Blue	Grey	Blue	Grey	Blue	Grey	Grey	Blue	Green	Grey	Grey	

Notes: grey = no significant value; blue = moderate value; green = high value

## 2 HYDRO-ECOLOGICAL ZONE: UPPER AYEYARWADY

### 2.1 Location of HEZ in Ayeyarwady River Basin

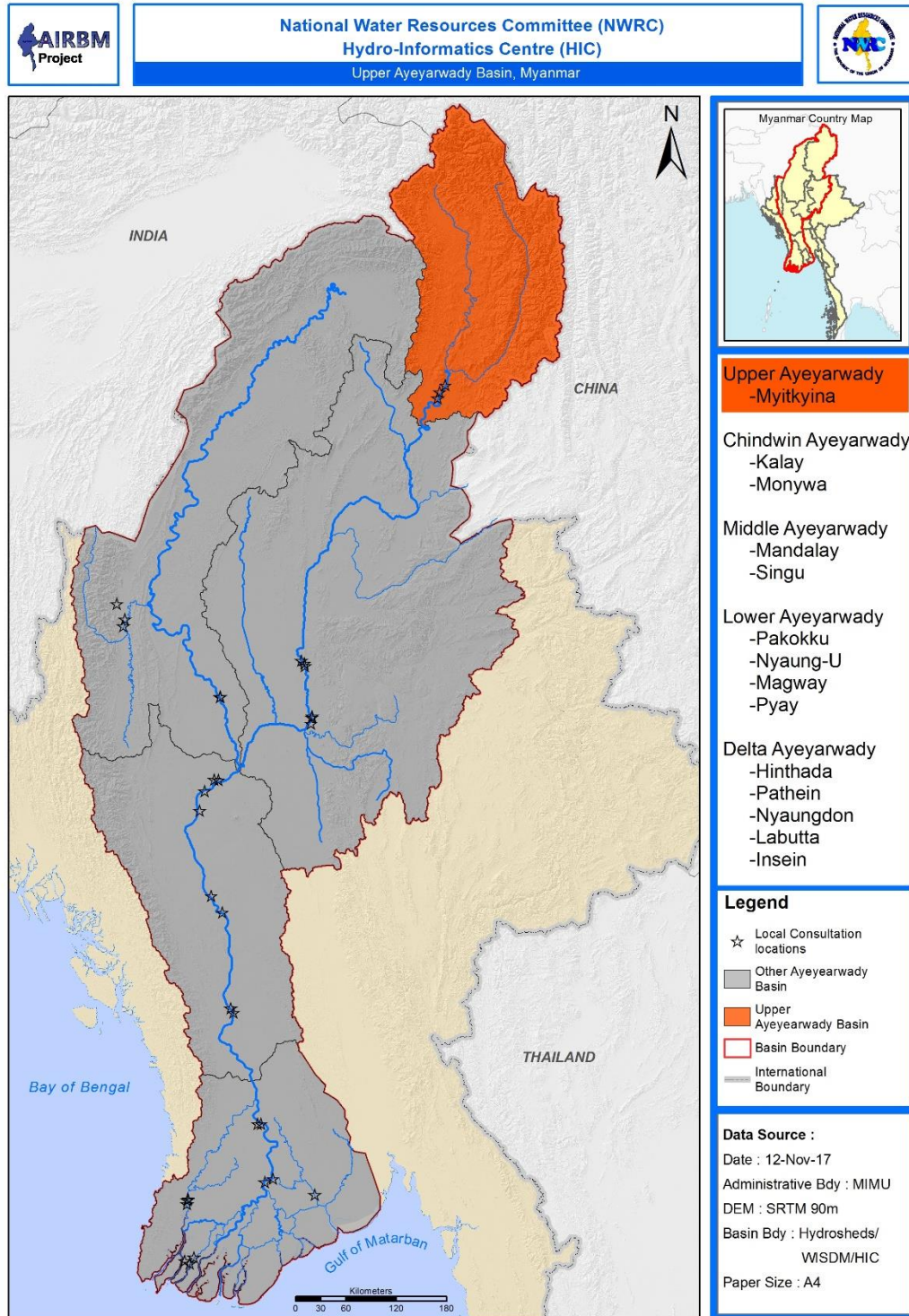


Figure 13 - Location of the Upper HEZ in the Ayeyarwady River Basin



2.2 Issues in Upper Ayeyarwady

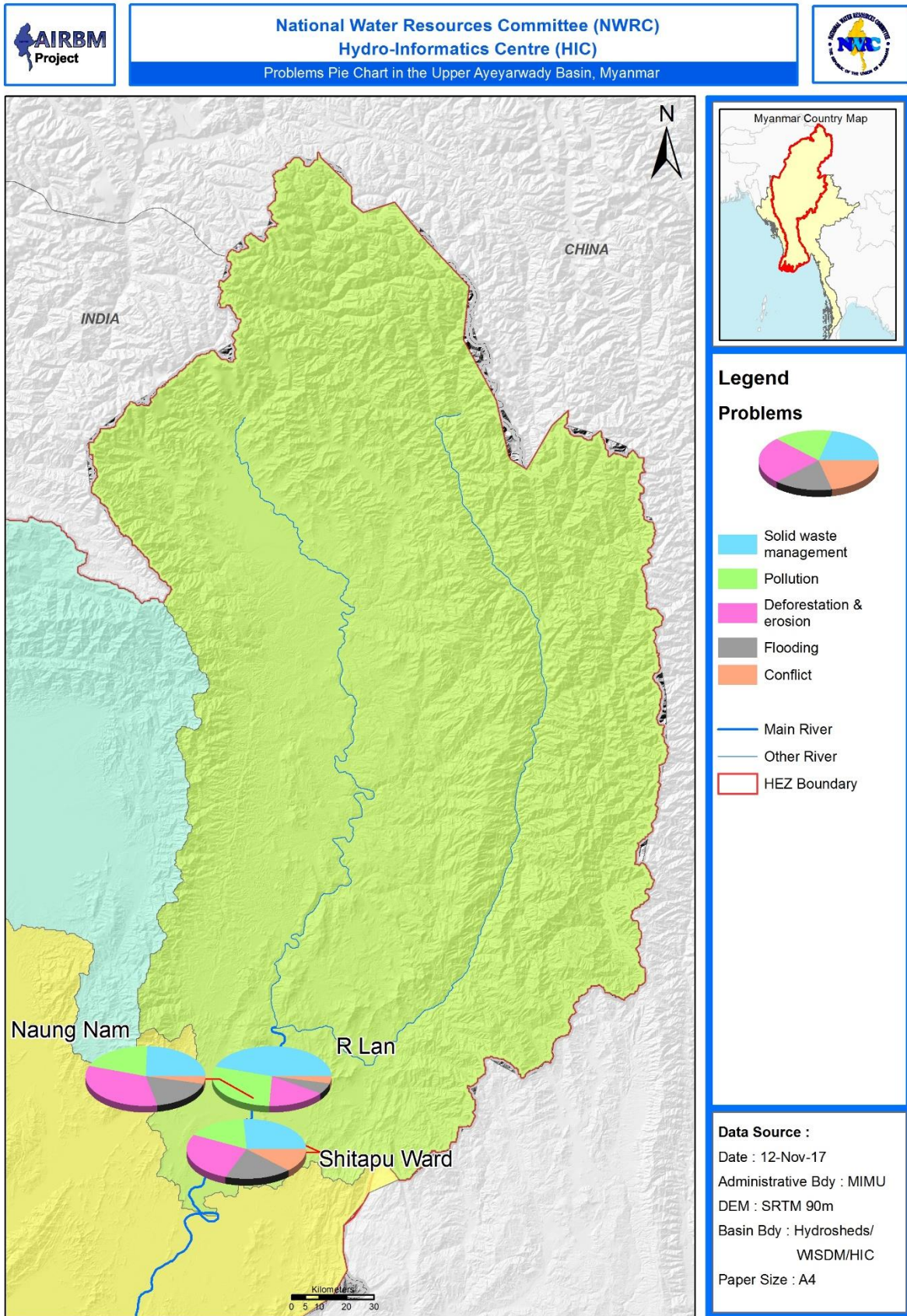


Figure 14 - Issues in the Upper Ayeyarwady HEZ, as indicated by villagers in Myitkhina Township



2.3 Values in Upper Ayeyarwady

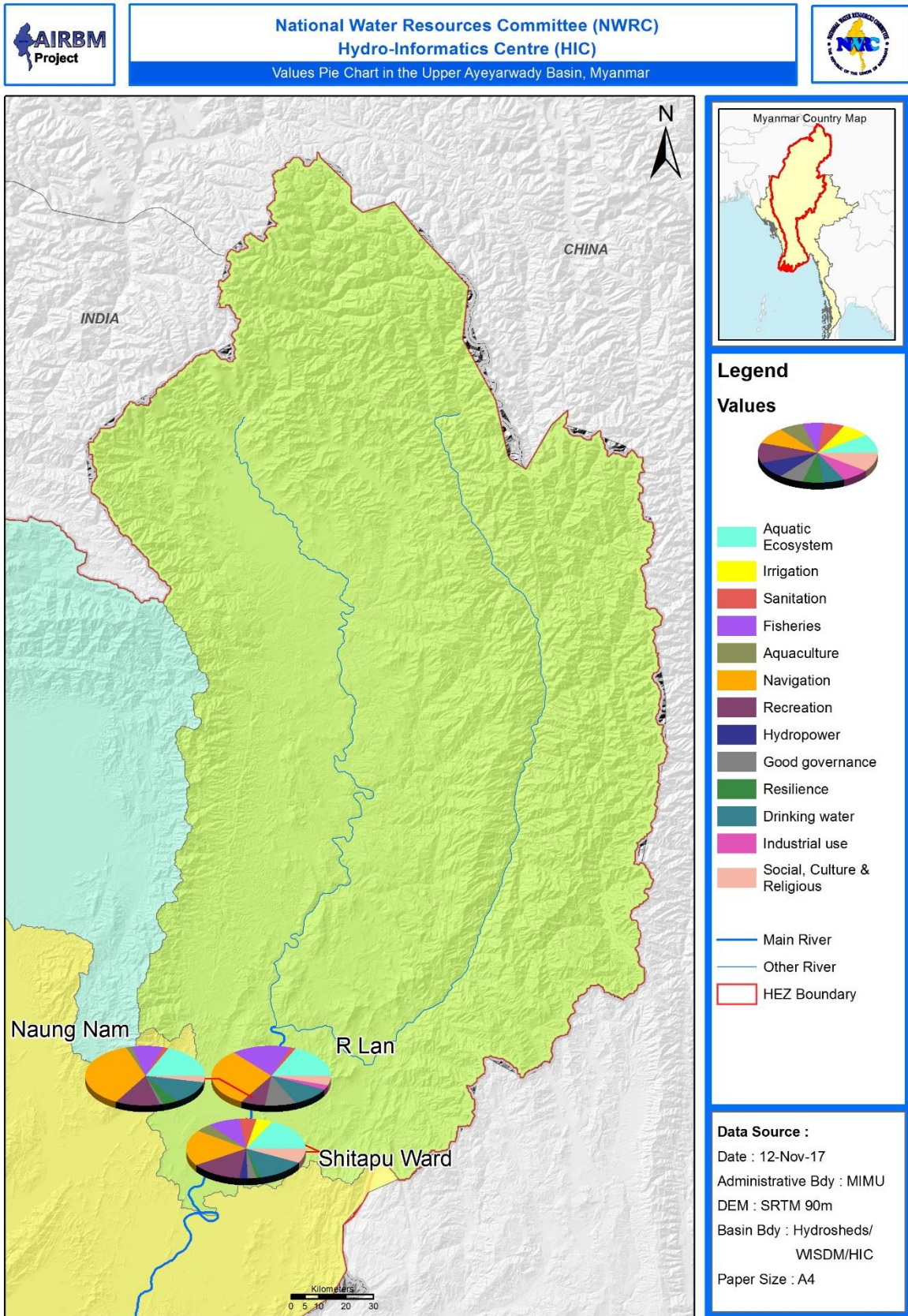


Figure 15 - Values in Upper Ayeyarwady HEZ, as indicated by villagers in Myitkhina Township

## 2.4 Issues of Concern in Upper Ayeyarwady HEZ

To create more opportunities in the Upper Ayeyarwady River Basin, there is need for peace to improve their livelihoods. Another concern is the construction of hydropower dams in the region. Villagers indicated on the 3D relief map what the plans are and why they are worried for the impacts on the Ayeyarwady River.



Figure 16 – Using the 3D model during community sessions

About 40 miles upstream from Myitkyina, the rivers Mali Kha (west) and N Mai Kha (east) merge to form the start of the Ayeyarwady River. There are currently no less than six new dams planned. The largest (Myit Sone) is already under construction not far downstream from the confluence, still upstream of Myitkyina. Of the remaining five, three are planned on the N Mai Kha river, and two on the Mali Kha. All of the dams are (to be) constructed by foreign firms from bordering countries.

A seventh dam is operational on a tributary to the N Mai Kha. The experiences with this existing dam are apparently negative according to the people: a lack of transparency on energy yield, beneficiaries, profits, environmental impacts, social impacts, and an intervention scope are executed, seemingly, without proper Environmental or Social Impact Assessment, causing many complaints.

The people tell in strong terms about their experiences: they are uninformed and often forced to leave their lands. This creates tensions between villages and a strong decline in faith in the state government. Electricity is produced nearby but the national government refuses to grant access to the electricity for the local communities.

The voices of the people seem to be increasingly heard at state and national level<sup>1</sup>. What the people in the Upper Ayeyarwady Region want, is **peace** in the Kachin State, followed by the creation of a federal system featuring a state constitution based on **shared power**, with education and opportunities. They would then perhaps be open to small scale developments that meet their needs. They value the Ayeyarwady River Basin as it is, and prefer to preserve it so that it can continue to *sustain* their lives as it has been doing for centuries, rather than extract energy and natural resources, particularly when these extractions are far greater than what they need to make a reasonable living. They emphasise that developments should only happen if they are welcomed by local communities.

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<sup>1</sup> During a Multi Stakeholder Forum session, a representative of the Ministry of Energy explained that Environmental Impact Assessments and Social Impact Assessments are obligatory now.

## 2.5 Myitkyina Township

### 2.5.1 R Lan

In R Lan village, **navigation** is an important value for transport of bamboo and because roads are not always accessible. The villagers explain that sometimes waterways suffer less restrictions than roads and are therefore preferred as a means of transport. **Fisheries** are valuable but mainly for domestic consumption. Fish used to be abundant in the river. Nowadays, hardly any fish is left because of **pollution**. **Solid waste** is a problem in this village, especially on the banks of the river, where people dump their waste, caused by a lack of **awareness**. There is no penalty system and the village does not have a waste collection service. Another source of pollution is the **gold mining** industry. Diesel residues from the engines, mercury, and waste water containing among others cyanide. The effects of the pollution are that you cannot bathe in the river anymore, because it is causing health issues like skin problems. **Drinking water** must be taken all the way from creeks in the mountains, using pipelines for transport and distribution. This is managed by a special local committee. Another problem faced by the village, is **deforestation** on the side of the banks. This is partly caused by regulations for local **land ownership**. To get a permit to own land, you need a plan for cultivation of the land, and this often implies clearing the land by the cutting of old trees. The deforestation on the banks causes **erosion** of the banks. At the same time, sands and gravel are deposited in the river bed as a result of the gold mining, according to the villagers. This illustrates how local morphology is out of balance, which could lead to more **floods** as well. During these floods, schoolchildren from other communities have more difficulty reaching the schools in this village.



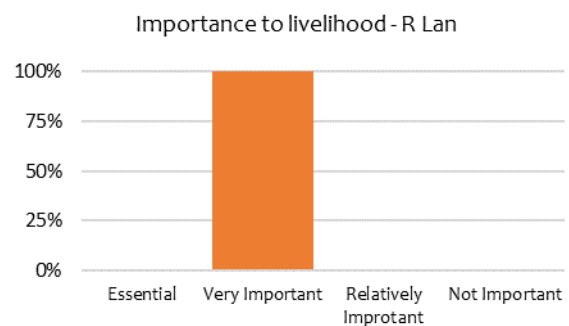
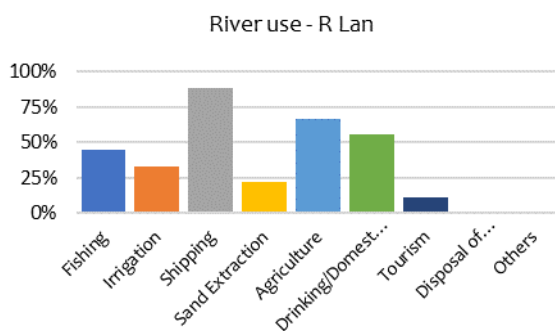
**Future dreams:** Currently, people are leaving the village because they do not see a future. Conditions for improvement are peace, awareness raising about waste and the natural environment, better secondary education and more job opportunities.

*“Dump soil from gold mining with large machine fell down into river and river depth is decreasing.”*

*“River bed is unequal, water is not clear. Few people fell down into sink and died while swimming.”*

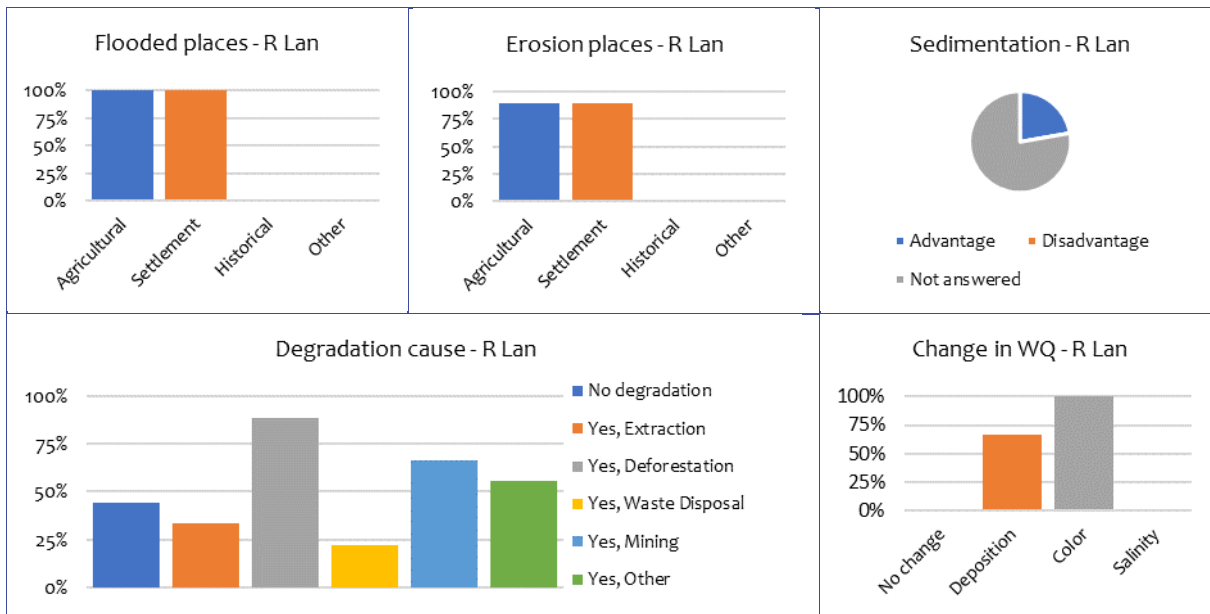
*“Government is doing some development but it is not effective, so it is hard to get a job for people.”*

~ Church teacher from R Lan (23 August 2017)





<b>DATE OF CONSULTATION</b>	23 August 2017
<b>NO. PARTICIPANTS</b>	28 (approximately 80% men and 20% women)
<b>OCCUPATION</b>	Many farmers, some bamboo traders
<b>BIGGEST VALUES</b>	Navigation, fishing, ecosystem
<b>BIGGEST PROBLEMS</b>	Pollution, solid waste
<b>HOT TOPICS</b>	Lack of awareness, gold mining, land ownership, deforestation



Villagers who came to community session

Discussion with villagers

Villagers investigate problems, values & maps



Discussion with villagers

Feedbacks and reports from villagers

Meeting at General Administration Department (GAD) office

2.5.2 Naung Nam

A Naung Nam villager stated at the start, “The Ayeyarwady River is our parent.” **Navigation** is an important value, because the village greatly depends on it. Navigation is important for transport across the river of **farming** materials and products, as well as for domestic and leisure purposes. It is also important for transport over longer distances up to Putao in the far north, of logs, timber and bamboo, and other products such as firewood, foods, clothes and education materials. Transport over the river is often the only option, since roads are not always available, in poor conditions or blocked during the rainy season. The ability to navigate also supports local **fisheries**. Apart from spatial access restrictions, an important issue with navigation is that large **gold mining** machines use big ropes across the river, blocking the way for boats and causing entanglements with rudders and propellers. Downstream it contributes to



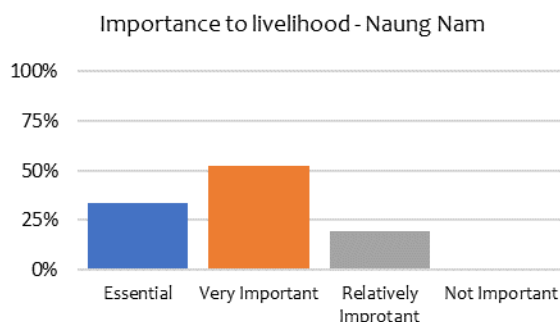
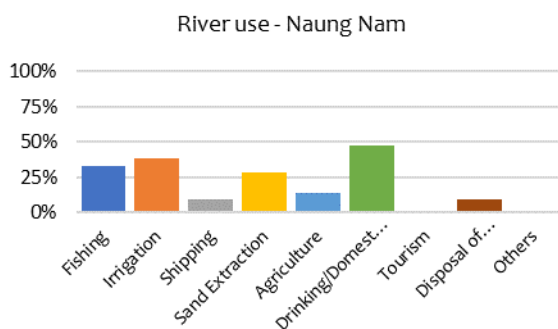
**erosion** as well, according to the villagers. The villagers propose to prohibit the operation of large machines near the banks and to apply strict law enforcement. People are also concerned that navigation will suffer from the construction of **dams** in the river. **Aquatic ecosystems** are another important water value. In the past, the water was clear and of good quality. People used the river banks as beaches and with traditional nets, fishing as a livelihood flourished. Since 2004, larger fish have disappeared due to **pollution** from gold mining and **fishing** with chemicals and the electrical battery method. It is mostly small scale fishermen employing these unsustainable methods, not the larger fishing companies. Only some small fish remain in the river and in creeks and prices for fish have increased. It explains why people in this village changed their dependency on fisheries. **Deforestation** happens upstream and leads to a decreased capacity for water retention, so the risk of floods has increased in recent years. **Solid waste management** is absent and waste is often dumped into the Ayeyarwady River.

*“Some vegetables are grown along the river bank.”*

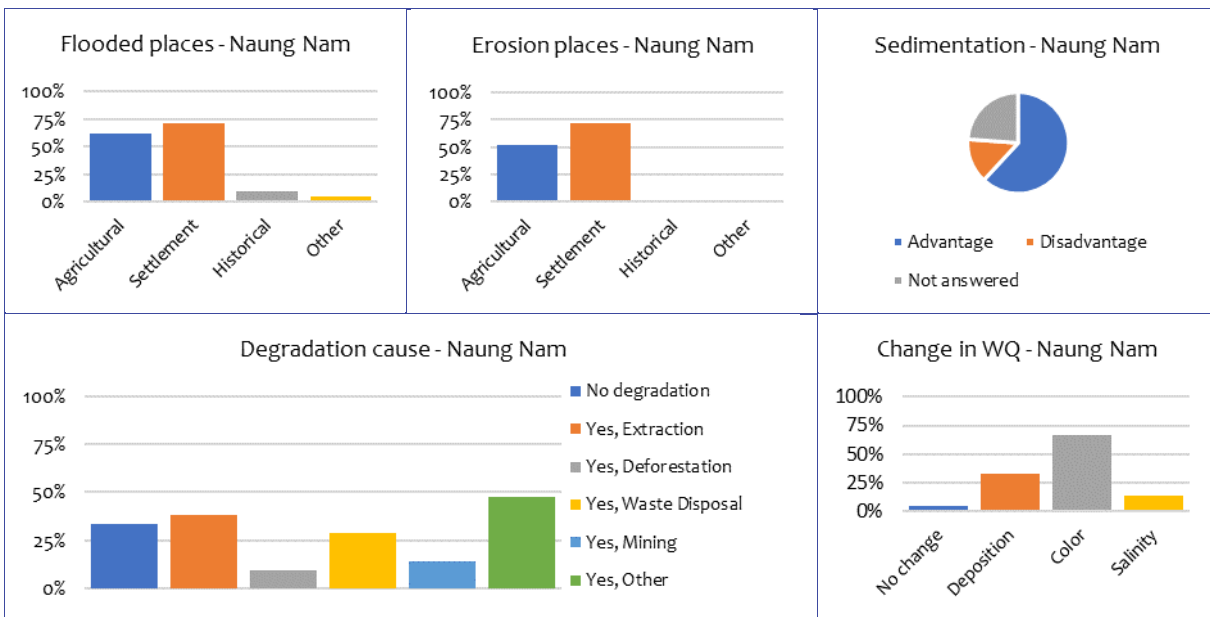
*“It would be great if the government creates a river security team to stop activities that harm the river system.”*

*“Dump soil from gold and jade mining should be carefully thrown, supervised by our government.”*

~ Farmer from Shitapu (23 August 2017)



<b>DATE OF CONSULTATION</b>	23 August 2017
<b>NO. PARTICIPANTS</b>	63. The Christian and Kachin traditions imply that the men are the undertakers and spokespersons, and the women run the households. This explains why men are in majority among the participants.
<b>OCCUPATION</b>	Farmers, some handicraftworkers, local business men, merchants
<b>BIGGEST VALUES</b>	Navigation, recreation, ecosystem
<b>BIGGEST PROBLEMS</b>	Erosion, solid waste, pollution
<b>HOT TOPICS</b>	Gold mining, deforestation



Villagers who came to community session



Discussion with villagers



Villagers investigate problems, values & maps



House wives also came and discuss



Church in Naung Nam Village



Discussion with Kachin Parliament member



2.5.3 Shitapu Ward

Until about the year 2000, **drinking water** could be taken from the river in Shitapu Ward. At that time, you could bathe in the river, the water was of good quality. After 2000, the river has become highly polluted, and this change has happened suddenly, over a small period of time. The causes for this pollution are threefold: **gold mining, dam construction** and **waste** from domestic and miscellaneous industrial sources. Without much known treatment, the industry discharges its processing residues and waste water, including mercury, into the river. Drugs are also a related problem for the villagers, affecting their social lives. **Drinking water** previously came from the river but nowadays people use **groundwater** wells. The quality of the groundwater is not good, presumably because of urban expansion, contact of the aquifers with the river, and infiltration of river water into the aquifers after floods. **Agriculture** used to be substantial in the area with extensive rice paddies, but nowadays only a small part is used with corn and walnut as the main products. Since 2011, licenses for chicken and pork breeding are easy to obtain for companies, but no longer for small-scale farmers. Development of the sector is slow because of the civil war, so job opportunities are declining and people increasingly depend on the gold mining industry. **Dams** are another major issue, in particular upstream from Myitkyina. The villagers want the hydropower project at Myit Sone to be stopped. The dams are thought to provide hydropower for export. **Floods** are not really a seasonal phenomenon in this area. The last big flood occurred in the year 2004. However, people are somewhat concerned about the resulting **bank erosion** and say that they would welcome measures to improve **bank protection**. **Solid waste** is a problem; there is no collection scheme and people dump their waste directly into the river.



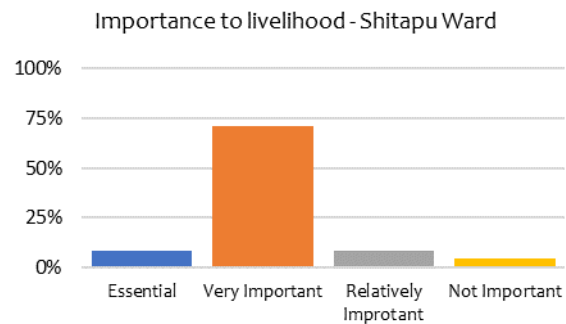
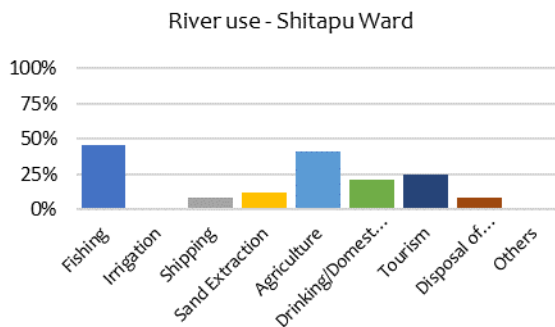
**Future dreams:** The villagers want peace, the removal of travel restrictions, and faster licensing procedures for small businesses would greatly help to further develop.

**“There is too much garbage in the river. River water is disgusting compared to years ago.”**

**“An issue is erosion due to flooding and people die every year.”**

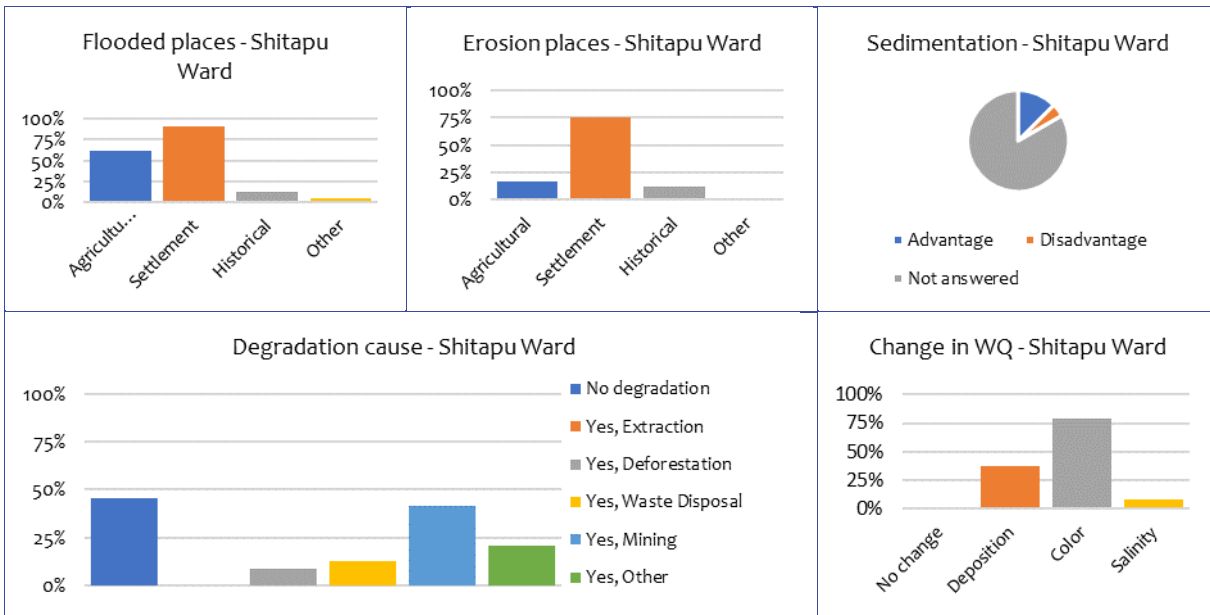
**“I don’t expect river will recover itself for now. But it might recover somewhat if government helps.”**

~ Village elder from Shitapu (22 August 2017)





<b>DATE OF CONSULTATION</b>	22 August 2017
<b>NO. PARTICIPANTS</b>	31
<b>OCCUPATION</b>	Farmers, shop owners, teachers, GAD officers, and representatives from Civil Society Organizations
<b>BIGGEST VALUES</b>	Recreation, navigation, eco, drinking water
<b>BIGGEST PROBLEMS</b>	Erosion, solid waste, river water pollution
<b>HOT TOPICS</b>	Hydropower dam, gold mining



Villagers who came to community session



Discussion with villagers



Explanation and discussion with 3D map



Villagers investigate problems, values & maps



Reporting issues on satellite map



Shitapu village GAD office

### 3 HYDRO-ECOLOGICAL ZONE: CHINDWIN

#### 3.1 Location of HEZ in Ayeyarwady River Basin

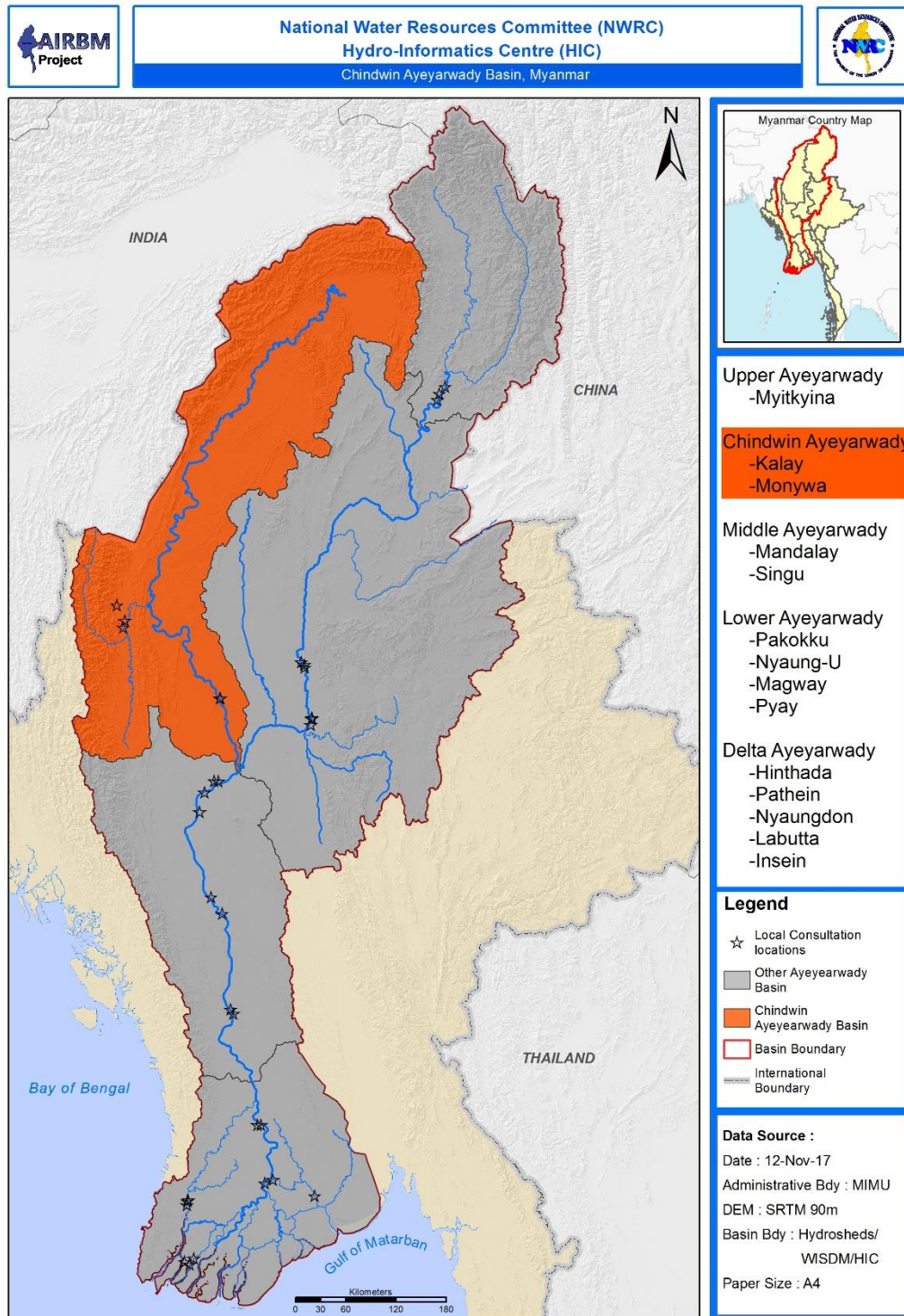


Figure 17 - Location of the Chintwin HEZ in the Ayeyarwady River Basin



3.2 Issues in Chindin

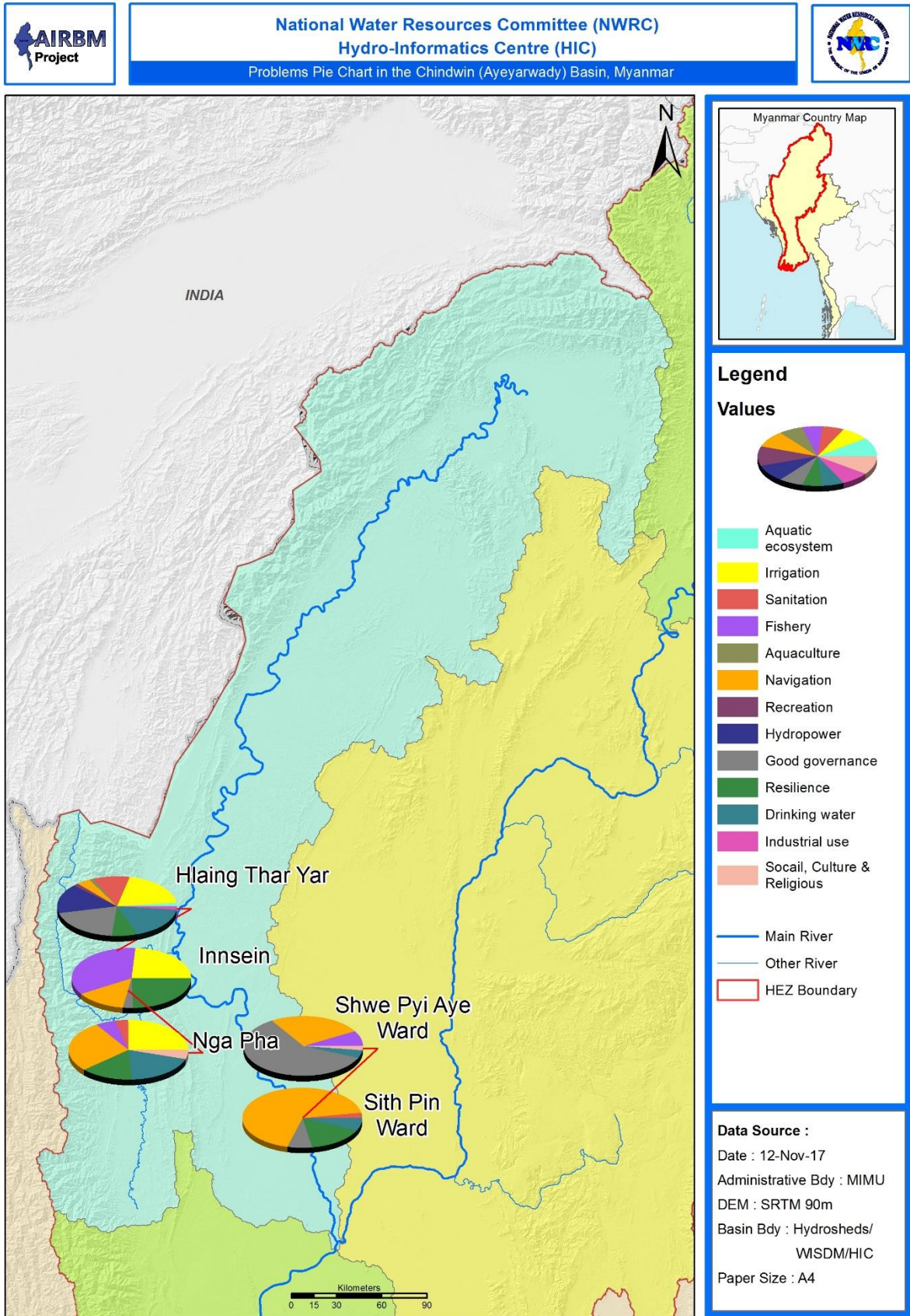


Figure 18 - Issues in Chindwin HEZ, as indicated by villagers in Kalay and Monywa townships

3.3 Values in Chindwin

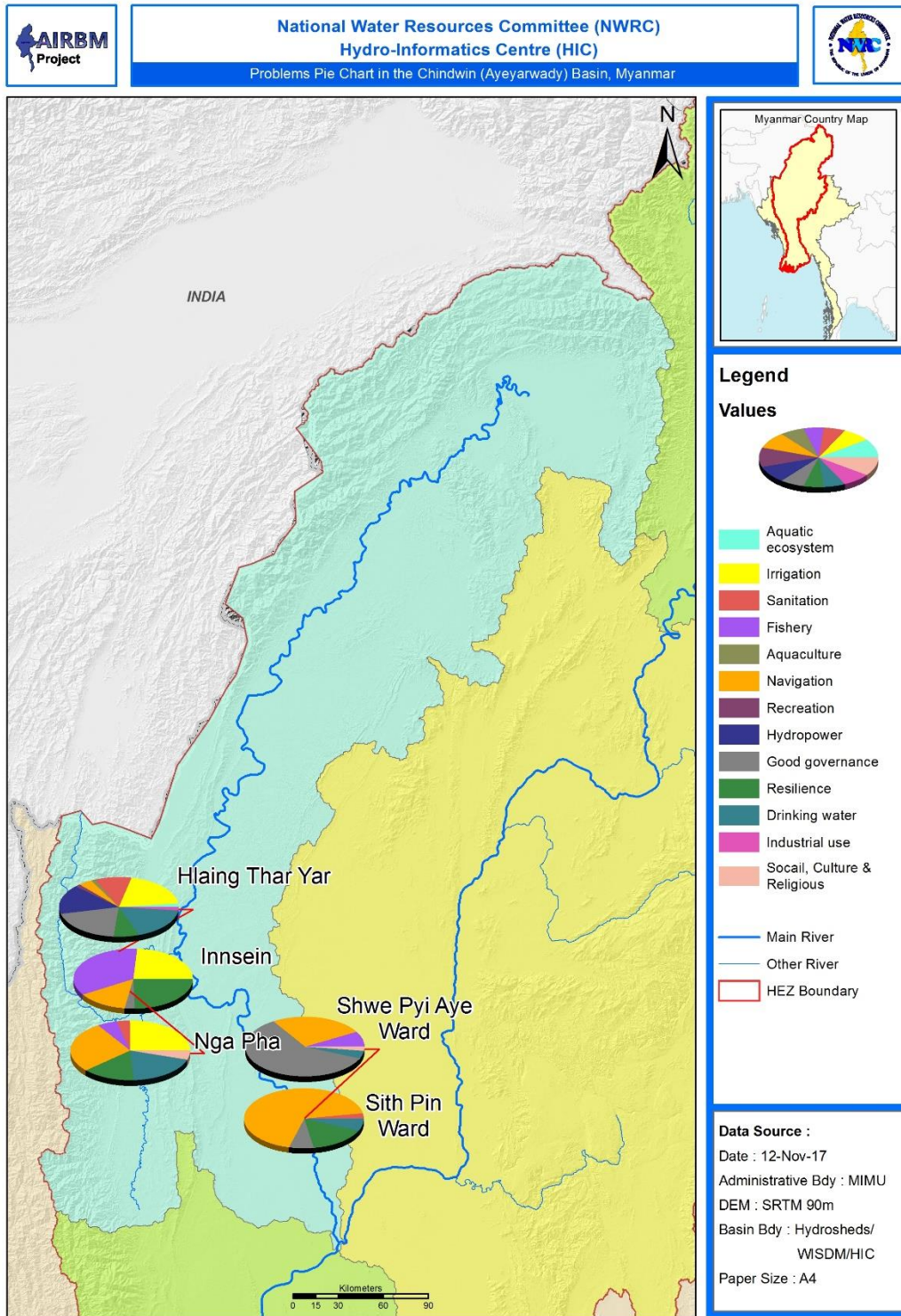


Figure 19 - Values in Chindwin as indicated by villagers in Kalay and Monywa townships



### 3.4 Issues of Concern in Chindwin



Figure 20 – Using the 3D physical model during community sessions

According to the villagers in Chindwin, the 2015 flood was mainly caused by **deforestation** in the mountain ranges. The reason for deforestation: wood production, mainly plywood. On the slopes there were landslides and in the village large amounts of sediments were deposited. The water depth reached 5 feet on average, mainly due to increased discharge from smaller mountain streams wherein flash floods occurred. The **sediments** (and also some waste) put the drainage systems upstream nearly entirely out of order. They clogged throughput, the flow stopped, and as a result, **irrigation** of the farmers' rice paddies ceased. Further downstream, small hydropower generators went out of operation because of little/no flow. Even now, two years later, the irrigation systems are still filled with sediment from the river. Luckily, alternative sources of electrical energy have been found: solar panels and hydropower from elsewhere.



Figure 21 – The entrance of the monastery of Hlaing Thar Yar



We visited village Sith Pin ward along the river in Monywa Township. It's population is roughly 400 people, of which about 100 attended the session. It was a very diverse mix of ages and gender, with a lively energetic group full of opinions, laughter, and jokes. Nearly everyone works in the bamboo sector. Transportation as well as the processing of derived products. First, a lady of respectable age was invited to share a brief history of this village. She told about the old days, when the villages produced metal products instead of the current bamboo, because of differences in market and demand. The village has not changed that much, apart from the fact that the population has grown. Few people have left, and reproduction did the rest. The biggest value that people attribute to the river by far is navigation, because of its role in the transportation of bamboo.



Figure 22 – Community session in Sith Pin Ward

**Bank erosion and flooding are also significant problems in the Chindwin Basin.** The bank erosion progresses inwards by approximately one foot per year, according to the villagers. About 80 households are under direct threat – we observed how trees on the banks have only recently toppled over and lay floating in the river, still attached to the shore by their roots. According to the villagers, they have two options: **reinforcement of the bank** (or construction of a dike), or **relocating** inland behind the existing protective dike. The villagers believe that the erosion is caused, or at least worsened, by **clay mining operations** for agriculture and brick making upstream, where apparently a big hole is dug to extract clay, disturbing the morphological balance. In addition, it is believed that **gold mining** activities have a large impact on erosion as well. Erosion mainly occurs during floods or high water. These, in turn, roughly occur two to three times per year, with an average duration of 10 to 15 days. During those periods, at ground level of houses near the river, depths are between 1 and 2 metres. If the problem of bank erosion can be solved, the villagers are confident that their community will flourish. Most people believe that 10 years from now life will be improved in the village. Not everybody agrees, though. One participant said, “there will not be a village anymore because of the erosion problems.”



Figure 23 – River bank in Sith Pin Ward



### 3.5 Kalay Township

#### 3.5.1 Innsein

Innsein village lies next to the former river bed that used to be a strong meander and is now a wetland. **Fishing** as a livelihood used to be important but has been much more difficult since the flood of 2015. Before the flood, fishing took place in the former meander, but this area has been filled by sediments during the flood, so now people have to carry their boats all the way to the main river, which is much further. **Irrigation** is important for farming, but the current supply of water is not enough. The upstream dam was impacted by heavy weather resulting in decreasing capacity for retention. Also the **drainage** system is not functioning well because large quantities of sediments are clogging the system. Therefore, people have to rely on mainly rainwater and plant very little during the dry season. Revenue from fisheries and farming has significantly declined since 2015. **Floods** are believed to be caused by extreme weather conditions together with **deforestation** and **sedimentation** of the river. The 2015 flood was the worst with extremely high water levels. People adapt to seasonal floods, which are considered a normal part of life that occur each year. The flood relief agency at the town entry provides alternative sources of income like employment in road construction and production of different crops. The agency also helps to repair the drainage system and provides additional employment for that purpose. People value **resilience**, which they explain as helping each other, also across community borders. The village applied to the local government for a shelter, where life and education can continue during floods. **Erosion** of the main river is a problem because farmland is gradually lost over a length of approximately 1,000 feet. Although people also own land located on the other side of the river, the new land that emerges on that side is generally not of much use because the deposited sediments are not suitable for farming.

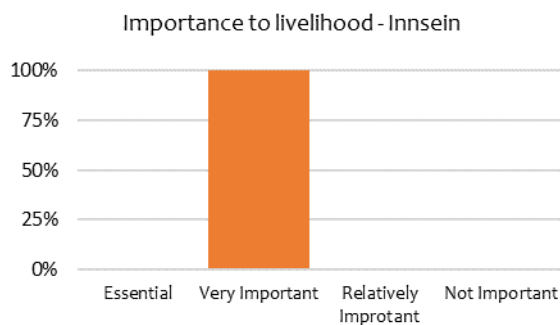
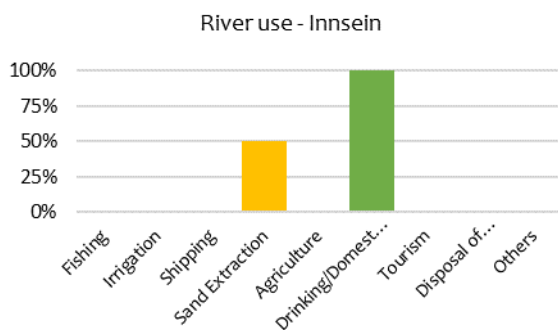


**Future dreams:** Most villagers told us that they do not know what to expect. Some of them think that not much will change compared to the current situation.

*“I have to carry my son on my back during floods. The floods cause trouble for us.”*

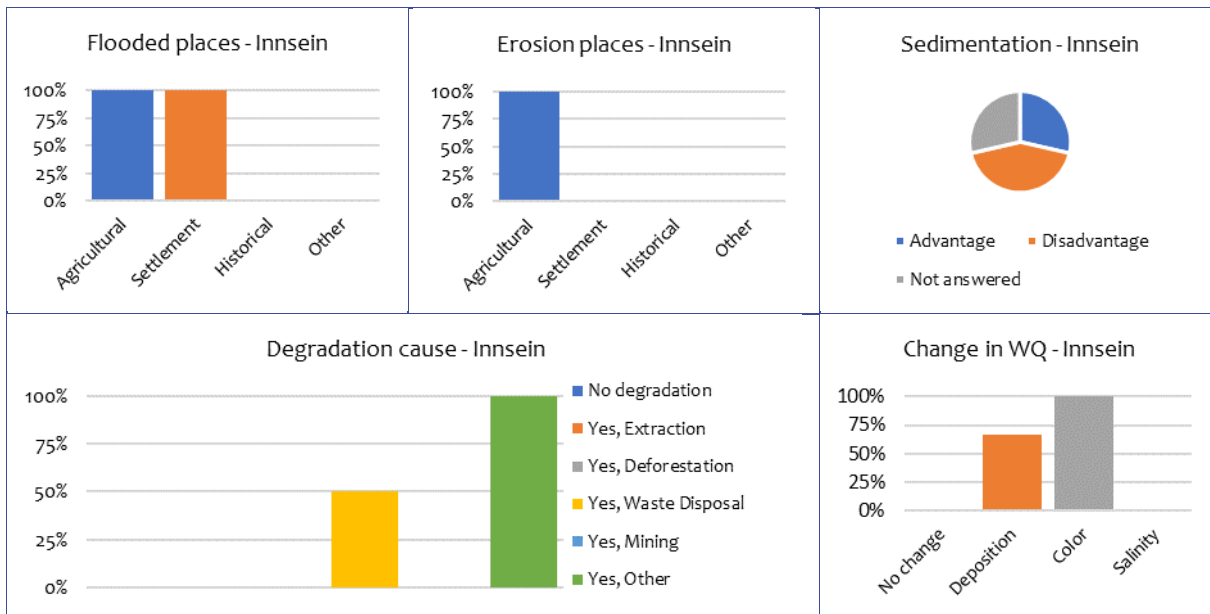
*“Large machines are used for irrigation instead of human workers, so we don’t have work and don’t have food.”*

~ House wife from Innsein (14 August 2017)





<b>DATE OF CONSULTATION</b>	14 August 2017
<b>NO. PARTICIPANTS</b>	50 (approximately 50% men and 50% women)
<b>OCCUPATION</b>	Handicrafts, fishermen, farmers
<b>BIGGEST VALUES</b>	Fishing, irrigation, resiliency
<b>BIGGEST PROBLEMS</b>	Flooding
<b>HOT TOPICS</b>	Resiliency, erosion, drainage



Monastery where community session is held



Villagers who came to community session



Explanation and discussion with 3D map



Villagers investigate problems, values & maps



Reporting issues on satellite map



Feedbacks and reports from villagers

3.5.2 Nga Pha

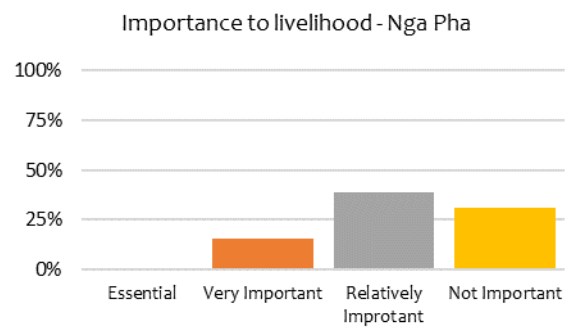
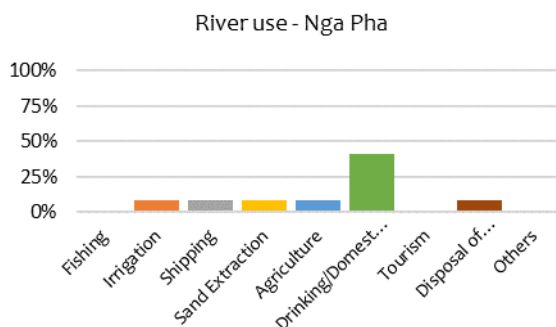
In Nga Pha village, **drinking water** is an important value. The village is on higher terrain and groundwater extraction is relatively difficult, especially during the dry season. The villagers are now working with the next village upstream to transfer drinking water using a pipeline. There are some concerns about the quality of this water due to **pollution** upstream. **Resilience** is of value because people believe it means “to help each other” under all circumstances, and under no conditions. This togetherness is strongly present in this village. The ability to easily **navigate** on the river is important, because farmers own land on both sides. Rice paddies on the mountainous side and ground root, sesame, and bean fields on the other flat side close to the river. **Irrigation** is crucial for the rice paddies. Most times, during the wet season, there is enough water, but sometimes there is a lack. Seasonal **floods** are problematic as they damage crops and leave large parts of land damaged beyond restoration each time. Nevertheless, they’re never disastrous, and even major ones (e.g., 2012 and 2015) have been dealt with: the community is very adaptive. After the 2015 flood, the river deposited gravel and rocks on the river bed, which is not fertile and cannot be used for **agriculture** until new layers of more fertile sediment are deposited. **Erosion** is also a problem. There seems to be a pattern where the rivers’ outer and inner bends swap every 10 to 15 years, taking turns in causing erosion and **sedimentation** on both sides of the river near the village. An entire settlement of numerous houses even disappeared, and residents had to **relocate**. This pattern also causes some **ownership** disputes over lost and gained land. But these disputes are usually fairly easily resolved between landowners with the help of the village head who chairs the meetings. People are specifically bothered by **solid waste** and, sometimes, dead animal corpses from upstream. Especially the effects of the associated pollution is a concern, because people might soon depend on **drinking water** from the next village upstream. They suggest that local government should provide more support on these issues, the way they already provide roads and health care.



**“We need drinking water, we have to get it from leaking small stream wells. Our children are young and need good water.”**

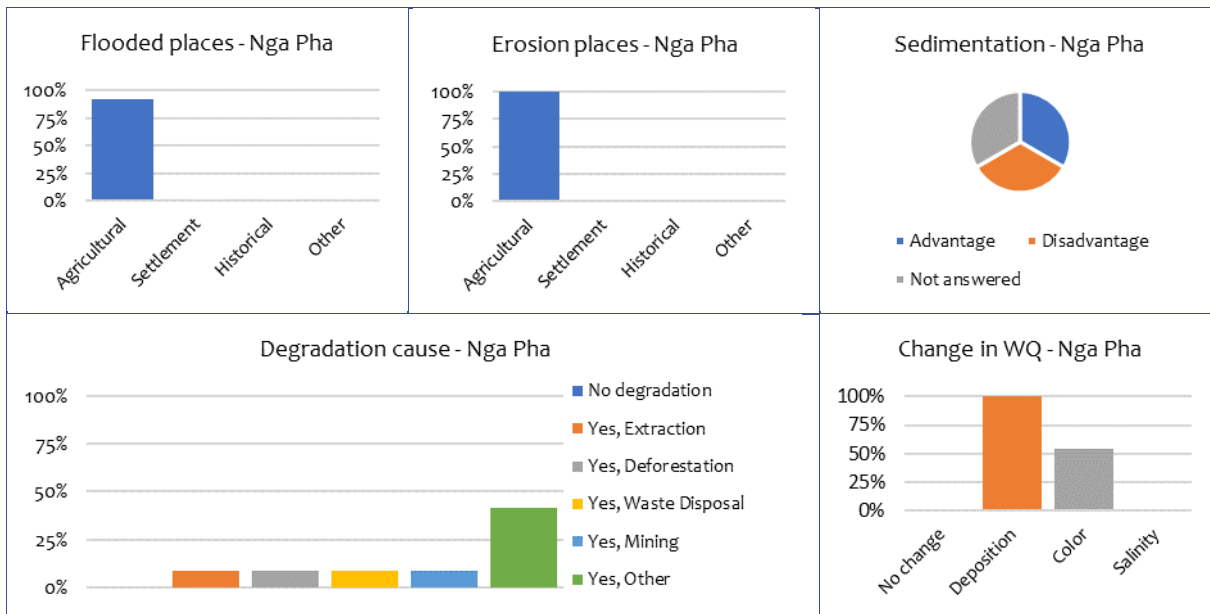
**“It is worse during hot season. Wells are dry and there is no water in the stream.”**

~ Primary school teacher from Nga Pha (13 August 2017)





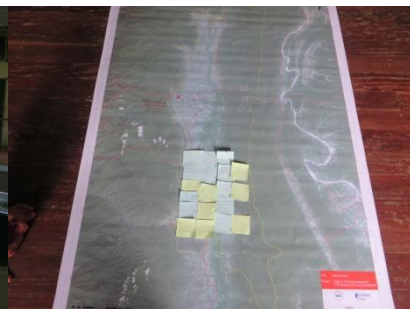
<b>DATE OF CONSULTATION</b>	13 August 2017
<b>NO. PARTICIPANTS</b>	Approximately 40 (approximately 60% men and 40% women)
<b>OCCUPATION</b>	Farmers, two school teachers and the village head
<b>BIGGEST VALUES</b>	Irrigation, navigation, drinking water, resiliency
<b>BIGGEST PROBLEMS</b>	Drinking water, erosion
<b>HOT TOPICS</b>	Resiliency, irrigation



Villagers who came to community session



Villagers investigate problems, values & maps



Reporting issues on satellite map



Interview with villagers



Mothers and children also participating



Field visit along the river bank

### 3.5.3 Hlaing Thar Yar

Kalay is located on the Myit Tha river branch of the Ayeyarwady River Basin. Hlaing Thar Yar village is located in the mountain range to the west of the main river valley. Floods are incidental during the rainy season. The **floods** in 2015 were a disaster; the effects of flooding killed a few people and forced about 40 families out of their homes. The farming sector was also gravely affected and currently does not contribute economically. According to the villagers, the flood was mainly caused by **deforestation** for plywood production, in the mountain range directly west of the village. Because of landslides, large amounts of **sediments** were deposited in the village. The water depth reached 5 feet on average, mainly due to increased discharge from smaller mountain streams wherein **flash floods** occurred. The sediments and **solid waste** blocked the drainage systems upstream, resulting in problems with **irrigation** and the small **hydropower** generators. Even now, two years later, the irrigation systems are still filled with sediment from the river. Alternative sources of electrical **energy** have been found: solar panels and hydropower from elsewhere. The quality of the **groundwater** as a source for **drinking water** is a major issue, the taste is different than it used to be. When there is a lack of water, people within the society share the water resources together. The community is **resilient** in this way. The villagers tell about the importance of **good governance**; the government does not take enough responsibility to deal with their problems. However, they state, it could be caused by bureaucracy and the many layers to reach the community and visa versa. **Solid waste management** is another issue, as are **pollution** and **health**. Awareness should be raised among the villagers, according to the people. A teacher explains that she educates her students about health, hygiene, waste, and respect for the environment. The school also has a health service that regularly provides awareness training for the students.



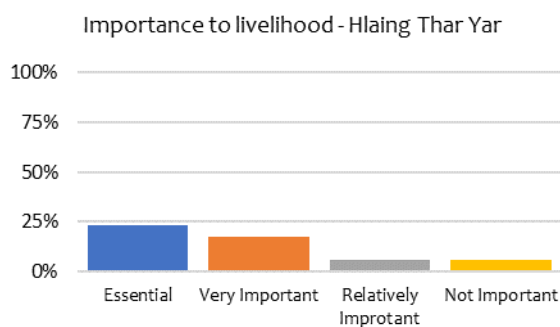
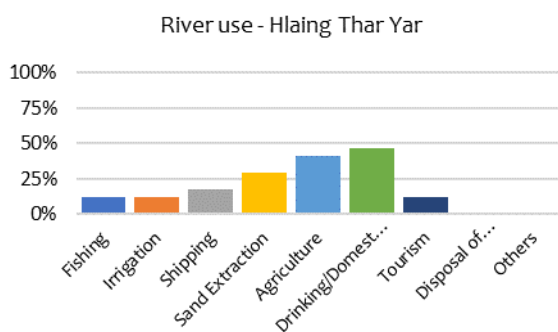
**Future dreams:** The last 20 years have clearly brought the village more welfare, despite catastrophes like the 2015 flood, and the people are optimistic that this process will continue. As an example, the teacher mentions that education was not at all available 20 years ago, but nowadays the village even has a secondary school. A similar story applies for health care facilities.

*“Natural causes like soil; farmlands are covered with it and we can’t grow anything anymore.”*

*“Wells don’t contain water due to environmental changes; even if they contain water, water is dirty.”*

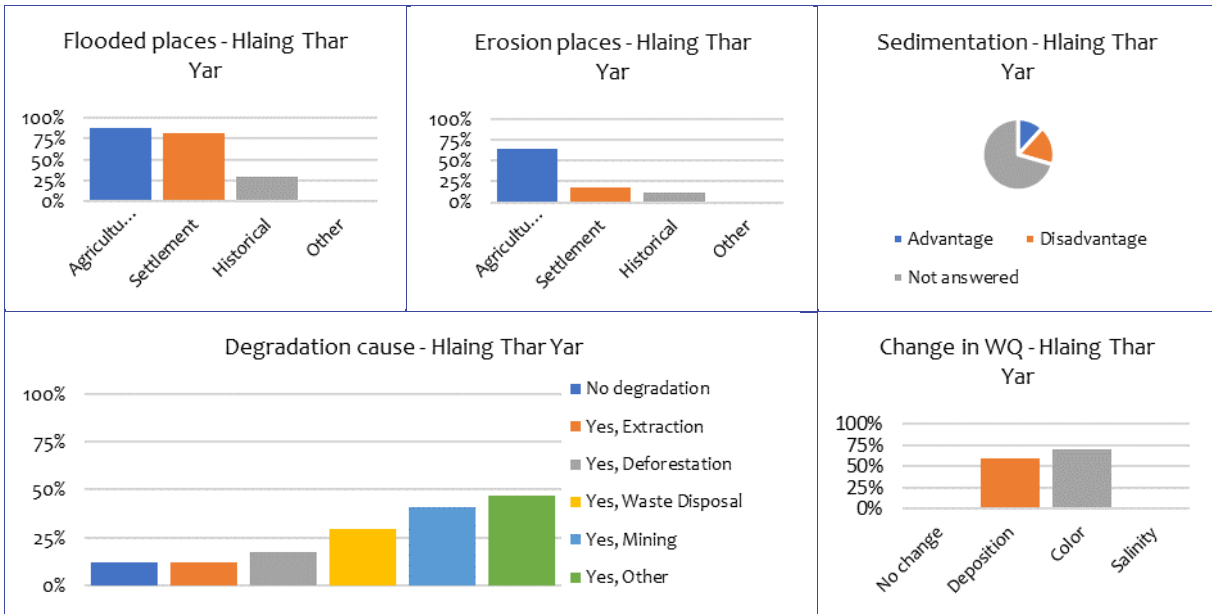
*“People should get knowledge first, educate them to keep a good and safe environment.”*

*~ Middle school teacher from Hlaing Thar Yar (13 August 2017)*





<b>DATE OF CONSULTATION</b>	13 August 2017
<b>NO. PARTICIPANTS</b>	20 (approximately 80% men and 20% women)
<b>OCCUPATION</b>	Merchants, farmers
<b>BIGGEST VALUES</b>	Good governance, drinking water, irrigation
<b>BIGGEST PROBLEMS</b>	Flooding, drinking water
<b>HOT TOPICS</b>	Alternative sources of electrical energy, governance



Villagers who came to community session



Explanation and discussion with 3D map



Interview with villagers



Villagers investigate problems, values & maps



Reporting issues on satellite map



Feedbacks and reports from villagers

### 3.6 Monywa Township

#### 3.6.1 Shwe Pyi Aye Ward

The villagers from Shwe Pin Aye Ward express great appreciation for **good governance** because their mayor provides **roads** and **electricity** for the community. Transportation is essential for this community to be able to export bamboo products like fences and roofing materials. People use the roads for transportation, but also the river (Chindwin), which explains why they find **navigation** an important value. Another important value is **drinking water**. In this village, the drinking water is of good quality and comes from **groundwater** wells. **Fishing** is valued as well, and is mainly done in a nearby lake along the river; over the last several decades the fish yields have been constant. **Floods** occur every year for a couple of days and make life a bit more difficult. For instance, children have problems reaching their schools. Sometimes floods are bigger and have greater impact, forcing people out of their homes into shelters. During these heavier floods, the village’s production stops entirely. There has been no significant change observed in the intensity of floods over the past decades. No embankments are present along the river. **Erosion** and **sedimentation** are also an issue: the river’s morphological dynamic behaviour creates uncertainty for transportation on the river. During dry season, the water level is very low. The people think that this has become worse since **dredging** activities started upstream. Also, it is believed that boats cause erosion. The villagers suggest to create a policy for a minimum distance between large ships and the river bank. For **solid waste**, there is a disposal place, but it is not often used. This does not seem to worry the people too much, however, because all in all, they do not consider **pollution** to be a real issue, apart from occasional plastics. More **law enforcement** would help to create a cleaner environment, though.

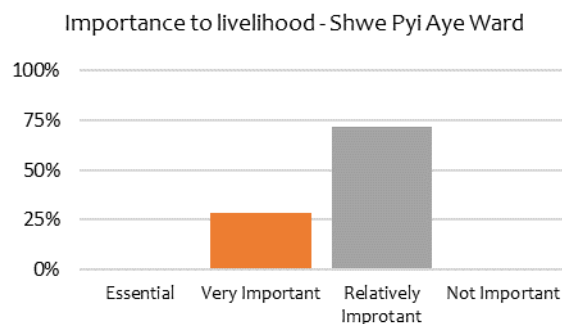
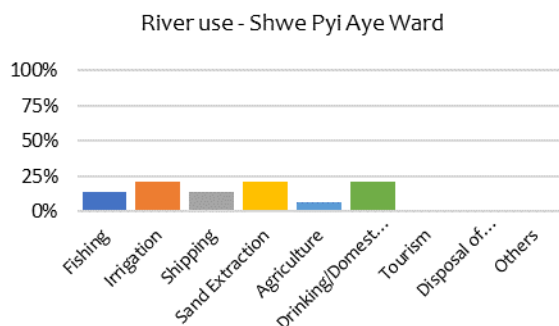


**“During dry and cold season, travelling in Chindwin River is hard and takes a long time.”**

**“Dumping soil waste into the river causes sedimentation and river depth is decreasing.”**

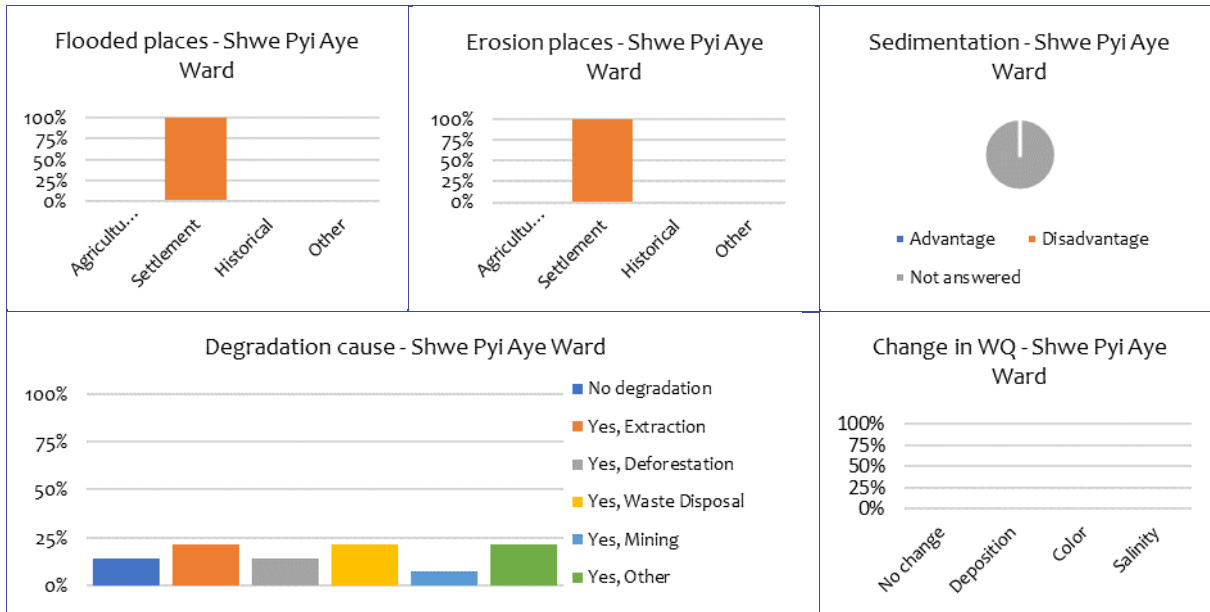
**“Therefore, ships and motor boats have to travel by using much fuel and lot of power.”**

~ Bamboo trader from Shwe Pyi Aye Ward (11 August 2017)





<b>DATE OF CONSULTATION</b>	11 August 2017
<b>NO. PARTICIPANTS</b>	38
<b>OCCUPATION</b>	Bamboo processing, handicrafts, farming and some fishing
<b>BIGGEST VALUES</b>	Good Governance, navigation
<b>BIGGEST PROBLEMS</b>	Infrastructure, flooding
<b>HOT TOPICS</b>	Dredging, law enforcement, good governance,



Discussion with villagers



Explanation and discussion with 3D map



Villagers investigate problems, values & maps



Interview with villagers



Team lunch at one of villagers home



Field visit to river bank near village

3.6.2 Sith Pin Ward

In Sith Pin Ward, a lady told us about the old days when the villages produced metal products instead of the current bamboo, because of differences in market and demand. The village has not changed much, apart from the fact that the population has grown. The biggest value that people attribute to the river is, by far, **navigation** because of its role in the transportation of bamboo.

**Resilience** is important, too, which is interpreted as people unconditionally helping each other whenever the need arises, thereby fostering a very cohesive community. People are very happy with the **drinking water** well that was provided to them by a local resident (the owner of one of the largest bamboo companies) via **ground water**. **Good governance** is important, and people are rather dissatisfied. The dissatisfaction concerns the fact that during a recent flood, this village was only provided with water, not medical aids and foods, unlike neighboring communities. The main problems faced by this community are bank **erosion** and **flooding**. The floods make it very difficult for school children to reach their schools. The bank **erosion** progresses inwards by approximately one foot per year and we observed how the bank seems to stepwise slide into the outer bend of the river. About 80 households are under direct threat – we observed that trees on the banks have only recently toppled over and lay floating in the river, still attached to the shore by their roots. According to the villagers, they have two options: reinforcement and protection of the bank (or construction of a dike), or relocating inland to a different location behind the existing protective dike. If the villagers were to relocate, they would have to rebuild their lives entirely (i.e., “start from scratch”), adapting their lives and work. The villagers believe that the erosion is caused, or at least worsened, by **gold mining** and **clay mining** operations for **agriculture** and **brick making** upstream. **Future dreams**: If the problem of bank erosion can be solved, the villagers are confident that their community will flourish. Most people believe that 10 years from now life will be improved in the village. Not everyone agrees, though. One villager said, “there will not be a village anymore because of the erosion problems”.



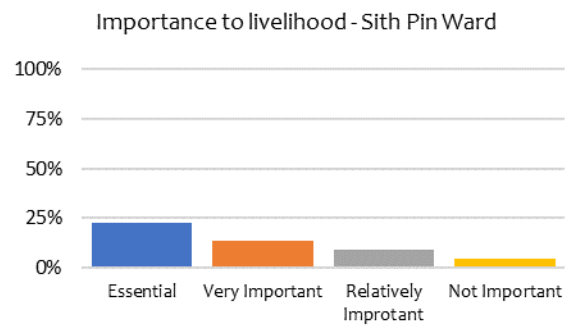
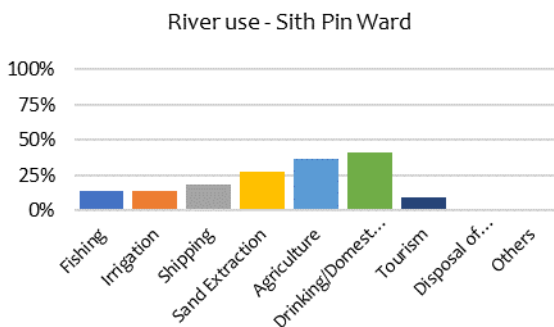
The floods make it very difficult for school children to reach their schools. The bank **erosion** progresses inwards by approximately one foot per year and we observed how the bank seems to stepwise slide into the outer bend of the river. About 80 households are under direct threat – we observed that trees on the banks have only recently toppled over and lay floating in the river, still attached to the shore by their roots. According to the villagers, they have two options: reinforcement and protection of the bank (or construction of a dike), or relocating inland to a different location behind the existing protective dike. If the villagers were to relocate, they would have to rebuild their lives entirely (i.e., “start from scratch”), adapting their lives and work. The villagers believe that the erosion is caused, or at least worsened, by **gold mining** and **clay mining** operations for **agriculture** and **brick making** upstream. **Future dreams**: If the problem of bank erosion can be solved, the villagers are confident that their community will flourish. Most people believe that 10 years from now life will be improved in the village. Not everyone agrees, though. One villager said, “there will not be a village anymore because of the erosion problems”.

**“Bank protection built for the village covers only half. We wish the bank protection can be completed and protect all of us.”**

**“Our livelihood is in trouble when floods occur.”**

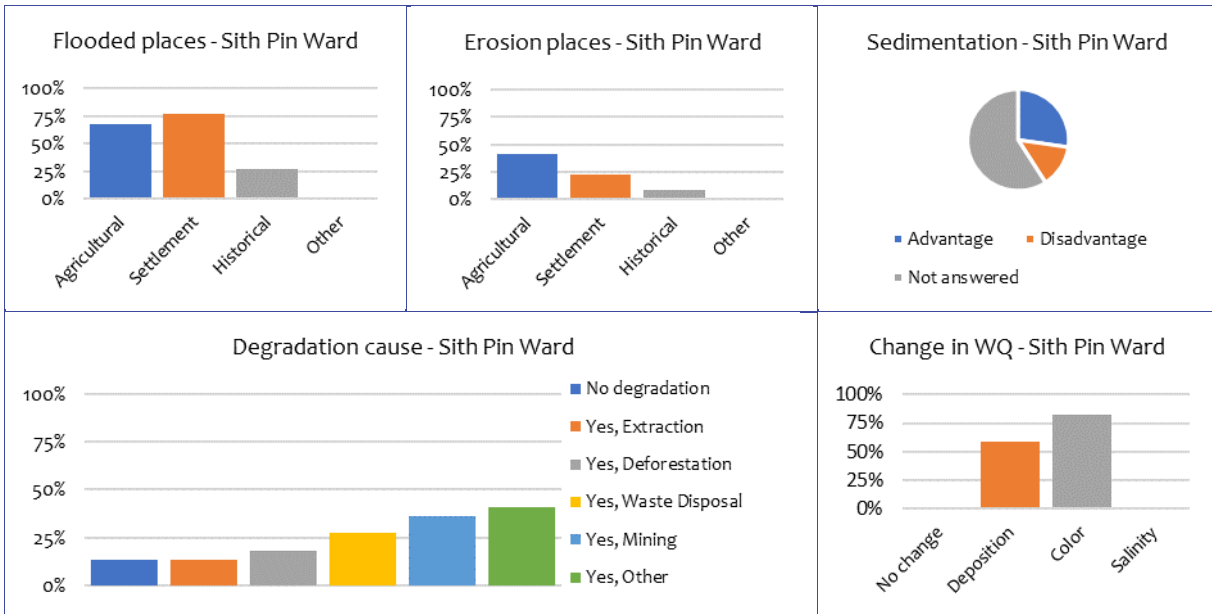
**“Last year, we got some food support during floods, but this year we only got drinking water.”**

~ Bamboo carrier from Sith Pin Ward (11 August 2017)





<b>DATE OF CONSULTATION</b>	11 August 2017
<b>NO. PARTICIPANTS</b>	86 (approximately 25% men and 75% women)
<b>OCCUPATION</b>	Mainly manual labour, like bamboo
<b>BIGGEST VALUES</b>	Navigation,
<b>BIGGEST PROBLEMS</b>	Erosion, flooding
<b>HOT TOPICS</b>	Resiliency, governance, gold & clay mining



Villagers who came to community session

Discussion with villagers

Villagers investigate problems, values & maps



GAD officer also discussing

Children studying the session

Bamboo workers near river bank

## 4 HYDRO-ECOLOGICAL ZONE: MIDDLE AYEYARWADY

### 4.1 Location of HEZ in Ayeyarwady River Basin

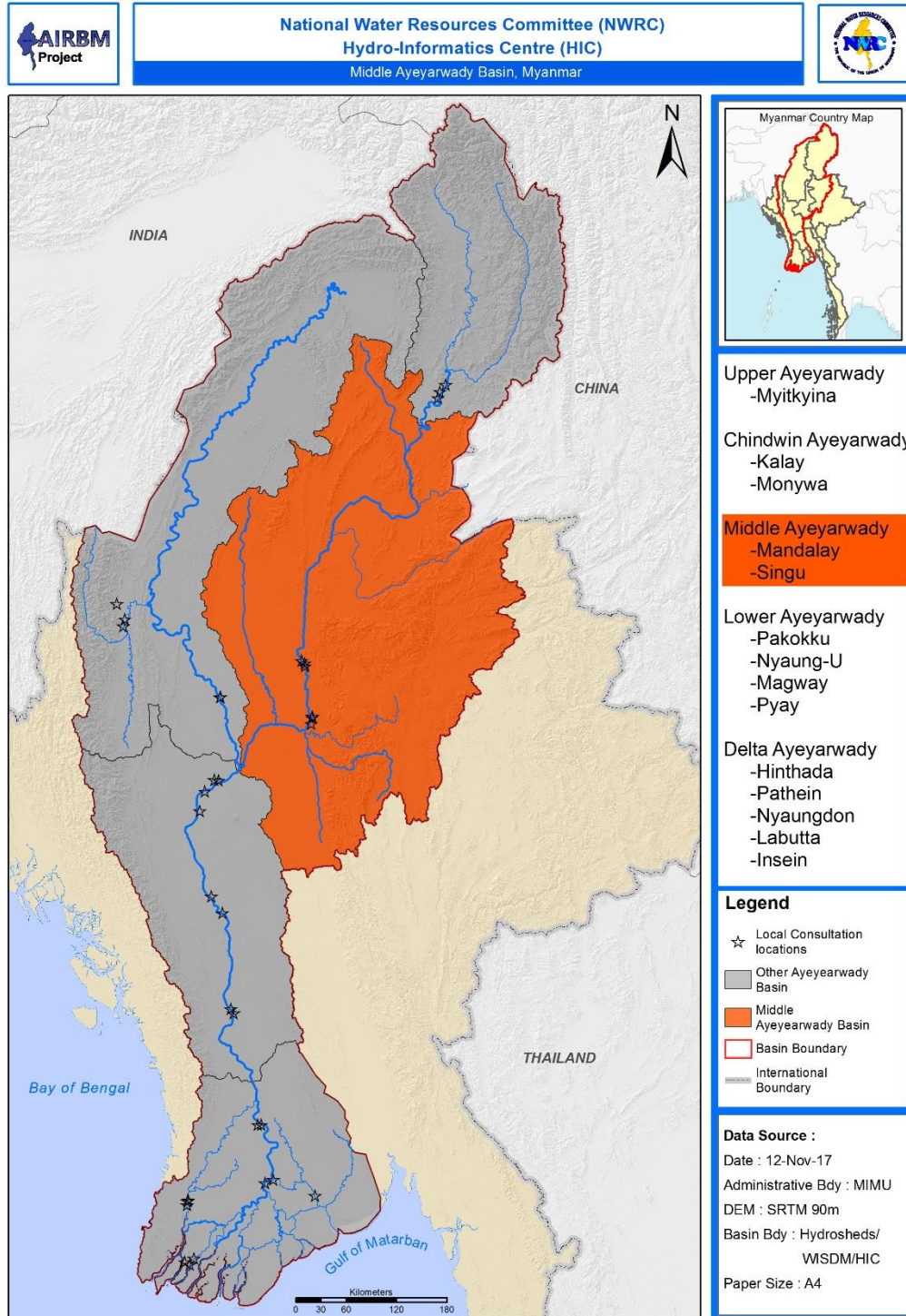


Figure 24 - Location of the Middle Ayeyarwady HEZ in the Ayeyarwady River Basin



4.2 Issues in Middle Ayeyarwady

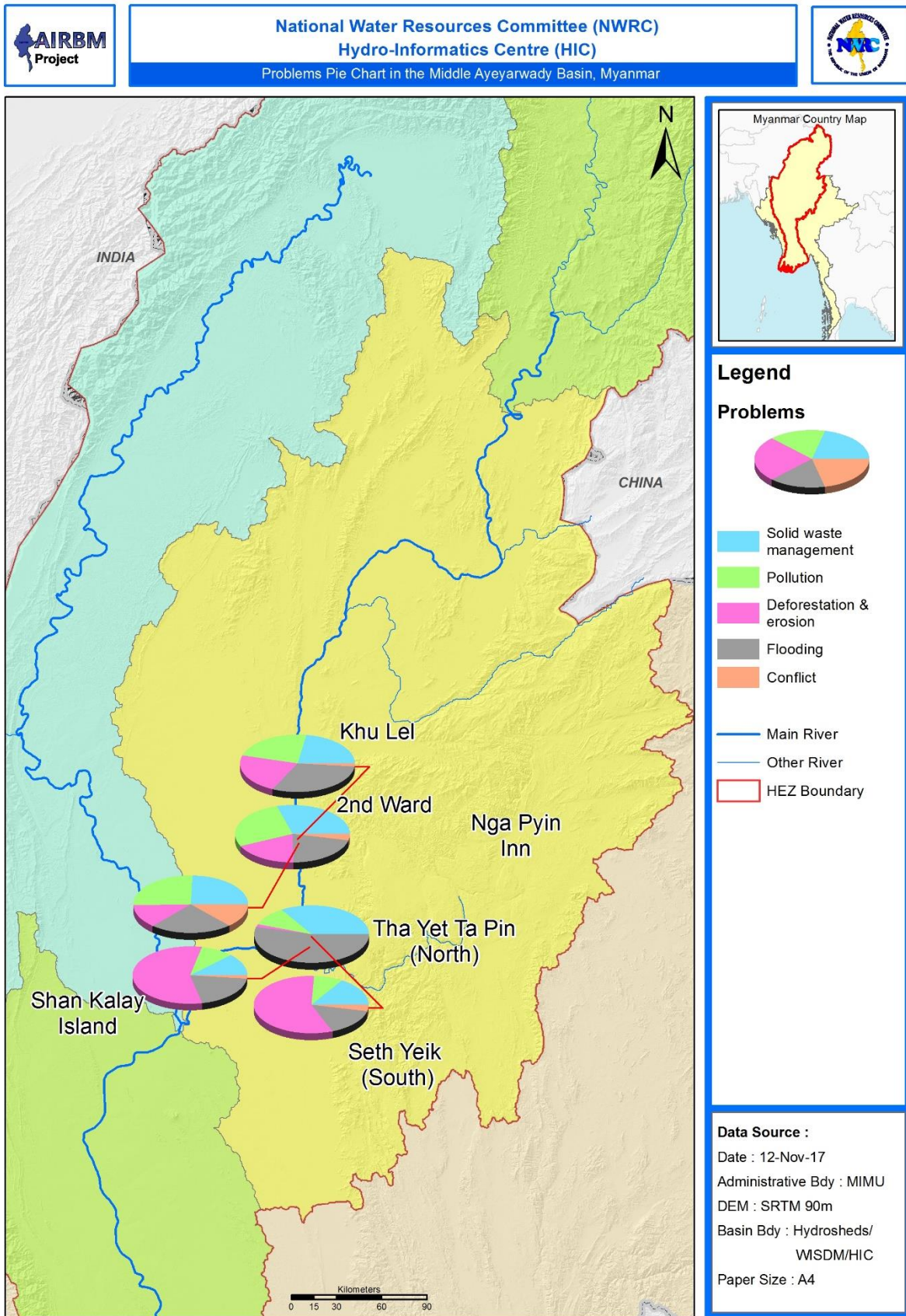


Figure 25 - Issues in Middle Ayeyarwady HEZ, as indicated by villagers in Singu and Mandalay townships

4.3 Values in Middle Ayeyarwady

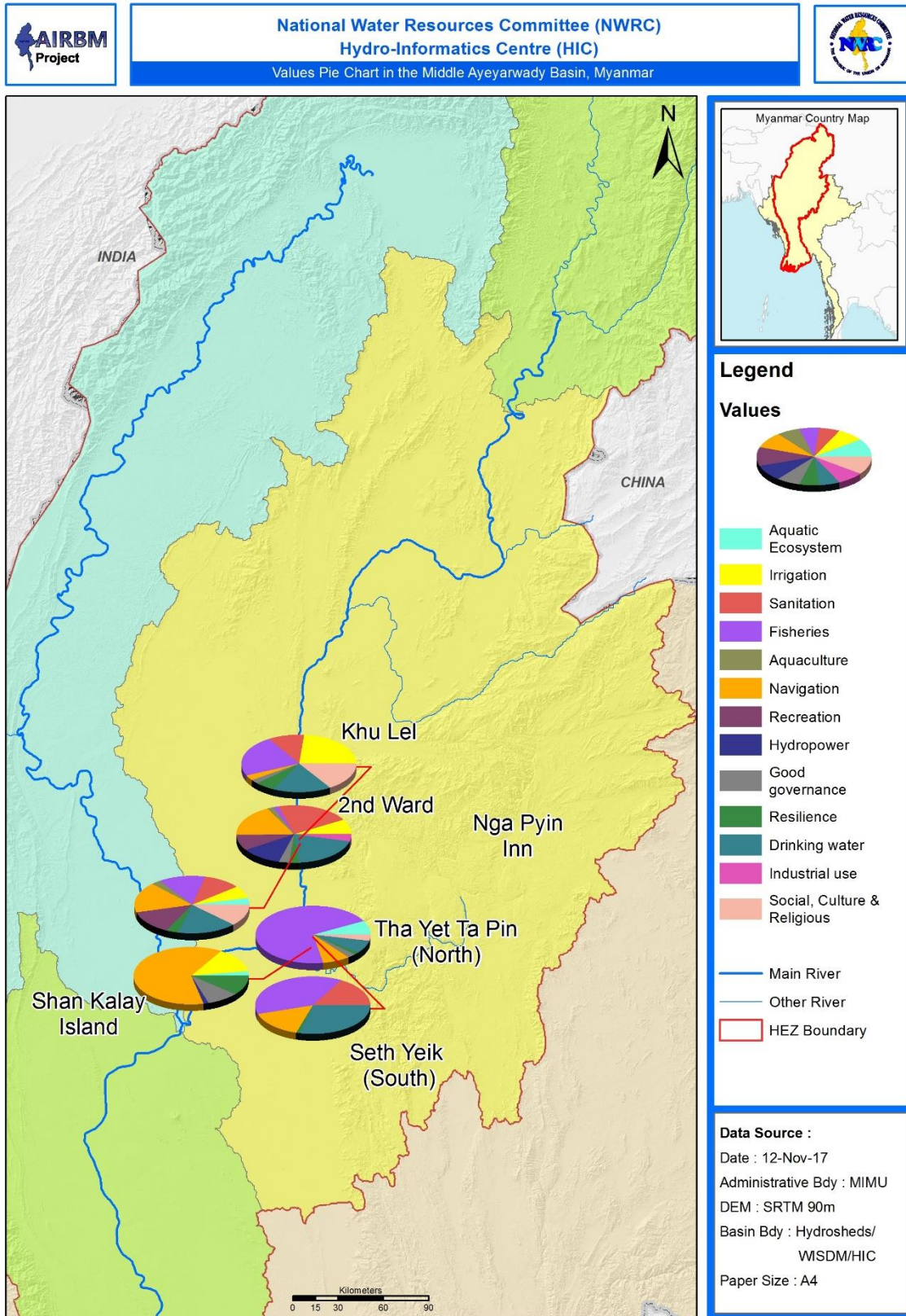


Figure 26 - Values in Middle Ayeyarwady HEZ as indicated by villagers in Singu and Mandalay townships



#### 4.4 Issues of Concern in Middle Ayeyarwady

The main issues in Singu and Mandalay are floods (Singu) and **erosion, navigability, unsustainable fishing practices, and weak law enforcement** (Mandalay). Some of the issues can be addressed by raising awareness and provision of support to improve adaptability among the people themselves. However, careful (urban) planning at the level of government is also required, based on knowledge of the river's hydraulic and morphologic behaviour. In some places, classic civil engineered interventions like protective dikes and channel fixations might be an option; however, it is recommended to first consider all options on awareness, adaptation, and spatial planning. Finally, the issue of law enforcement should be assessed. It is possible that this will lead to the need for more manpower, capacity, and adjustment of work procedures at the level of the enforcers and their managers.



Figure 27 - Presentation during the community session in Khu Lel

## 4.5 Mandalay City

### 4.5.1 Shan Kalay Island

Shan Kalay Island village lies on new land: **fertile sediments** that were only recently deposited there by the river's changing morphology. People explain that they are very eager to cultivate the new land, but that obtaining **ownership** and permissions to do so is difficult. The greatest concern that people have in this village is **bank erosion**, stretching over approximately 1.5 mile along their land. This bank erosion is believed to be caused by the increasing numbers of ships passing by and increasing ship sizes, resulting in heavier wave action. **Farmland** close to the river is disappearing by erosion, whereas elsewhere undesired **sedimentation** occurs. According to the villagers, a fixed **navigation** channel in the middle of the river is required to prevent the river from widening any further, along with controlled dredging with the aim to regulate morphological behavior. The deposition of sediments on their lands can be very fertile, especially during the **floods**. The floods are not so much an issue. No one has to move from their home during the floods and the houses are well adapted by the way they are built. Farmlands highly depend on these seasonal floods because there is no **irrigation** system and the amount of rain is limited during the dry season. **Pollution** is not considered to be a problem, either, despite there being no **solid waste management** regime. Waste is thrown into the river and believed to disappear to the south into the sea. The villagers told us that they believe downstream communities are not negatively affected by their waste. **Drinking water** comes from **groundwater** wells and is of good quality.



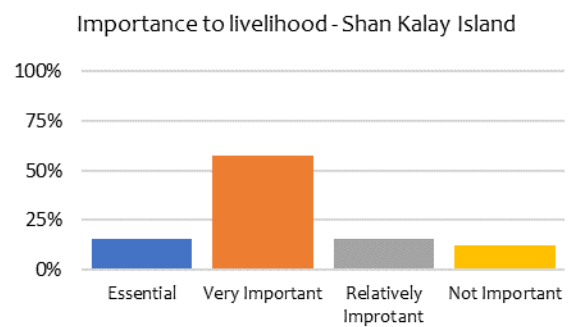
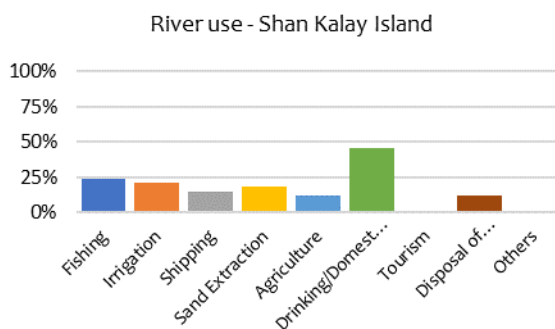
**Future dreams:** The future perspectives for this village are bright. If the government helps the people to protect their land from bank erosion, people are convinced that a wealthy future lies ahead, with urban development, private sector investments, good education for their children and broader job opportunities beyond the current sectors of fishing and handicrafts.

**“River shape is changing and farmlands are lost due to erosion.”**

**“If government can stop sand banks accumulating at middle river, that would be great.”**

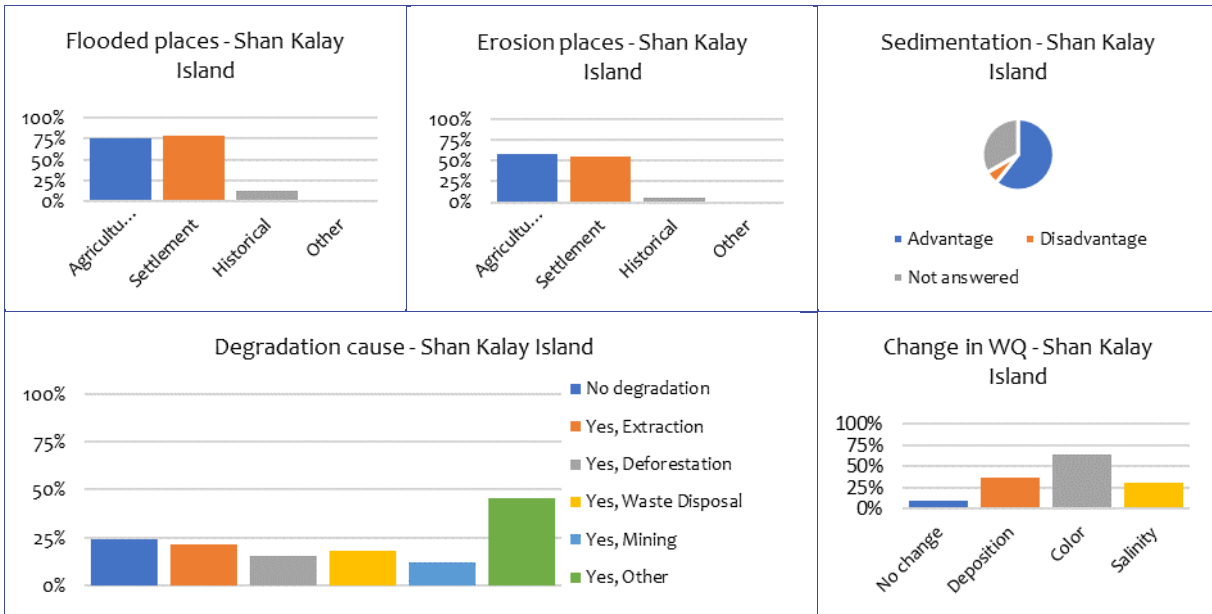
~ Village administration officer from Shan Kalay Island

(9 August 2017)





<b>DATE OF CONSULTATION</b>	9 August 2017
<b>NO. PARTICIPANTS</b>	146 (approximately 35% men and 65% women)
<b>OCCUPATION</b>	Farmers
<b>BIGGEST VALUES</b>	Navigation
<b>BIGGEST PROBLEMS</b>	Bank erosion
<b>HOT TOPICS</b>	Ownership, permission, increasing numbers of ships passing by



Discussion with villagers



Villagers who came to community session



Villagers investigate problems, values & maps



Reporting issues on satellite map



Explanation and discussion with 3D map



Group photo at village's pagoda

4.5.2 Tha Yet Ta Pin (North)

Tha Yet Ta Pin (North) is on an island connected to the main land by a concrete bridge of that is approximately 6 feet wide, which is under water during the wet season. During the dry season the bridge emerges above the water and the villagers do not have to use their boats to reach the mainland. According to the villagers, **fisheries** are facing issues. To catch enough fish, they need to travel further away, sometimes 5 hours by boat. They know how the fish move, and follow the trail. The fishermen cannot fish closer to where they live because of illegal electrical battery fishing that occurs at night time by unknown, small-scale fishermen who kill nearly all of the fish. Electrical battery fishing also occurs where the villagers travel to fish, but the fish abundance there is still such that it is worth the effort to travel. According to the villagers, they need improved **law enforcement** and **monitoring** at night. People generally see a decline of revenues from fisheries, but believe that the community will flourish in the future as new types of work will be available, such as electrical welding. **Navigation** is an important value and fishermen sometimes experience the adverse impacts of changing depths and shallow areas (i.e., changing morphology). **Drinking water** is also a value, although people historically extracted more from the river and **groundwater** than they do nowadays. Water extracted from wells and the river must be stabilized for one night before drinking. The villagers mostly drink purified water. **Floods** are indicated as the biggest issue. Two major floods occurred in 2004 and 2012. At every significant flood, life comes to a standstill for approximately three days, but people can remain in their houses because the houses are well adapted. Every household has at least one boat. There is no **waste** disposal or collection scheme and, therefore, waste is dumped into the river from both sides of the island, depending on proximity to the water from individual households.

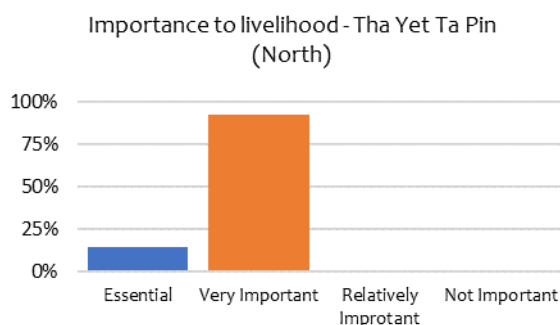
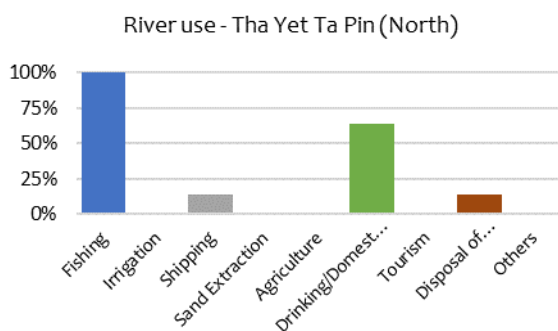


**Future dreams:** People are optimistic. They expect growth, not so much in fishing, but in manual labor and in developing skills like electrical welding. The villagers indicate that improved microfinance schemes would be most welcome to stimulate the launching of new small businesses on the island, as well as to provide for a community co-operative fund meant for the benefit of all and for social cohesion. People believe that many of their youth will remain on the island thanks to the expected improvement of living conditions.

*“All allowed fishing areas are far upstream, so we have to go there. We have to work only when fishing land owner call us to work at their area.”*

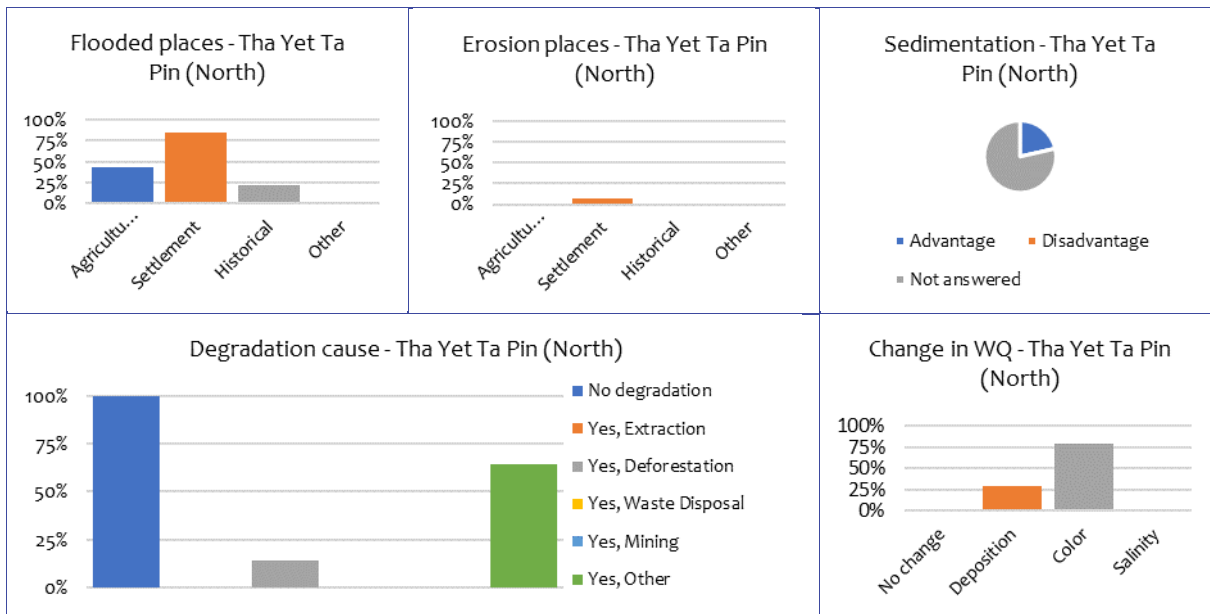
*“This village is an island village, so not much land for farming. People just go to town for work.”*

~ Fisherman from Tha Yet Ta Pin (North) (10 August 2017)





<b>DATE OF CONSULTATION</b>	10 August 2017
<b>NO. PARTICIPANTS</b>	30 (approximately 70% men and 30% women)
<b>OCCUPATION</b>	Fishing
<b>BIGGEST VALUES</b>	Fishing
<b>BIGGEST PROBLEMS</b>	Flooding, solid waste management
<b>HOT TOPICS</b>	Electric battery fishing, law enforcement



Villagers who came to community session



Discussion with villagers



Villagers investigate problems, values & maps



Feedbacks and reports from villagers



Video interview with villagers



Houses and school in village

### 4.5.3 Seth Yeik (South)

In Seth Yeik (South), **fishing** as a livelihood is considered the greatest value of the river, but it has become much more difficult in the last 3 to 4 years due to unregulated fishing with the electrical battery method by people from outside of their community. This illegal practice kills most of the fish that this community depends on. **Law enforcement** by the government to prevent these practices is weak. To resolve the problem, the villagers suggest that **zoning** should be improved, and better law enforcement is required. **Sanitation** is an attributed value because the river is used as a toilet for most villagers. They believe it is not necessary to improve sanitation systems. People take their **drinking water** from the river and find that the water is of good quality, better than from **groundwater** wells. During the dry season, the water is clear; during the wet season it is more turbid. As a possible link to drinking water, a woman mentions the fact that normally during the wet season small babies tend to be sick more often, whereas during the dry season, if they have a **health** issue, it is diarrhea. The main problem faced by the island is **erosion**. Since April 2017, dredging of sand for construction right opposite the island is believed to have caused land to be eaten away. This has not been discussed between the villagers and the local government. **Solid waste management** is absent; garbage is thrown into the river. **Transportation** and **infrastructure** to the main land is also a problem, especially when weather conditions are causing floods. A bridge is needed according to these villagers; it would help, for instance, in transporting their children to school more easily. The biggest **flood** was in 2004, when the water level of the river reached the first floor of their houses and lasted for 20 days. Also, the flood in 2016 was significant with a duration of 10 days. During floods, the people still can continue with their work, but at a slower pace. Despite the isolation of the village by the Ayeyarwady River, the village is still connected to the **electricity** grid which crosses the river. Everyone in the village has the possibility to charge their cellular phone, for example.

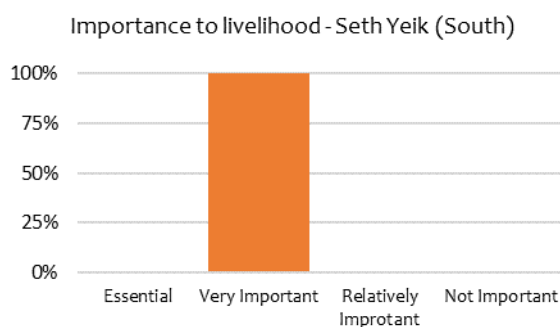
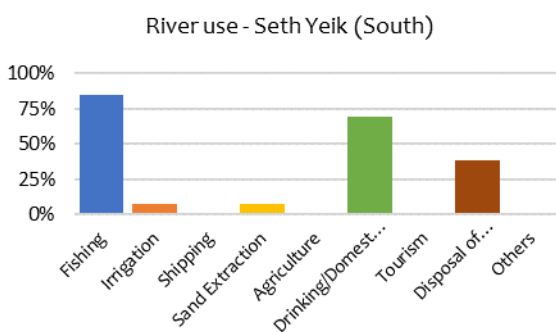


**Future dreams:** People are confident that their community will flourish, provided that the problem of erosion is dealt with effectively. They are convinced that their productivity will grow, thereby improving their livelihood and wellbeing. As currently there is no school on the island, they are overwhelmingly unanimous in expressing that they want better education facilities for their children.

**“Sand extractors are working near to our village. If water level rises, houses are destroyed due to erosion.”**

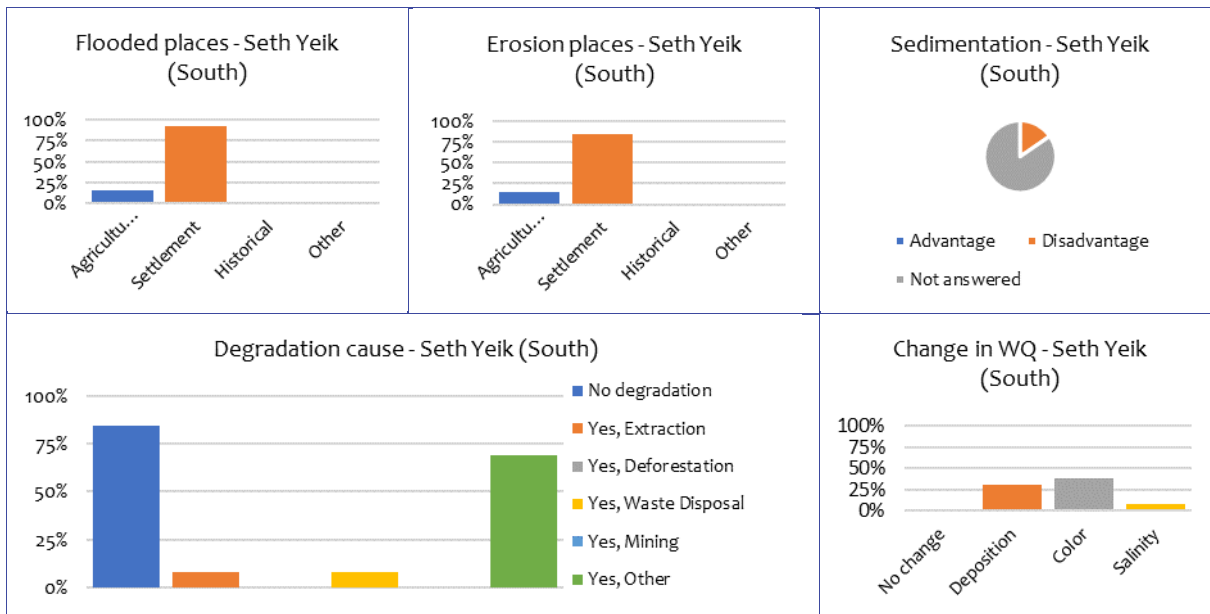
**“I heard fishermen are also having difficulties because fish decrease due to battery shock fishing.”**

~ Merchant from Seth Yeik (South) (9 August 2017)





<b>DATE OF CONSULTATION</b>	9 August 2017
<b>NO. PARTICIPANTS</b>	37 (approximately 50% men and 50% women)
<b>OCCUPATION</b>	Fishermen, manual laborers (handicraft), traders
<b>BIGGEST VALUES</b>	Fishing, drinking water, navigation, sanitation
<b>BIGGEST PROBLEMS</b>	Erosion, transportation & infrastructure, solid waste management
<b>HOT TOPICS</b>	Electric battery fishing, law enforcement, zoning



Villagers who came to community session



Reporting issues on satellite map



Villagers investigate problems, values & maps



Feedbacks and reports from villagers



Houses in Seth Yeik (South) Village



Floating house at river bank

## 4.6 Singu Township

### 4.6.1 Khu Lel

Khu Lel village is located amidst the **floods**. The difference over the last few years is that water levels seem a bit higher, and the floods last a bit longer. The villagers explain that every year during the rainy season, a total of 60 days on average, life is “standing still”. The schools close and children stay at home. There is hardly any **fishing**, and because farmlands are far away, **farming** is impossible. Most of the houses are built on poles, but still some flood. **Drinking water** from the river becomes much less drinkable because it is mixed with more turbid waters from mountain rivers. Villagers need to improvise, buy their foods from nearby communities, and catch fish from nearby fish ponds. Flooding also brings **fertile alluvial soils** and water to the land, so agriculture benefits from it. However, a better **irrigation** and water retention system would be helpful during the dry season. The people sell their products from farming and fishing to fellow villagers, and to the workers at the gold mines project area called New Yone, which is a good market for them. **Solid waste** is an issue, as well. There is a collection facility at the far end of the entrance road to the village, but some waste ends up on the streets or in the river. All houses have bamboo hedges around them to prevent waste from flowing into their properties, since waste gets spread over the village during wet season. By tradition, the villagers honor their ancient rulers and heritage. Every year in August, they take a Buddha statue from the monastery, put it on a boat and sail around with it, visiting 12 other villages. This is why the river has a **cultural and religious value**.

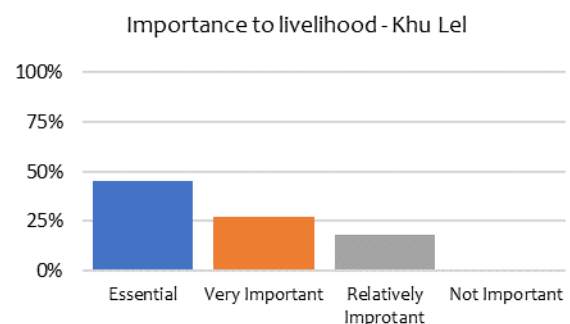
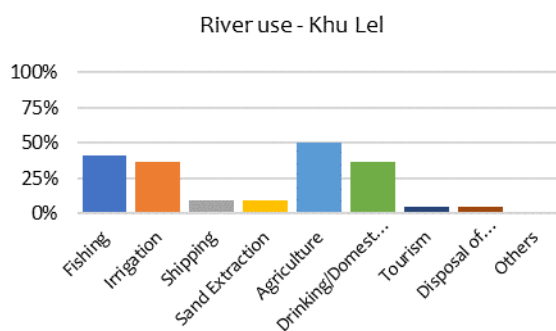


**Future dreams:** Education is still a bit poor in this community, however, youngsters intend to stay. People hope for more development and a better livelihood, with the help from the government. They would particularly welcome new and upgraded infrastructure, as well as an increase of yields from farming and fishing, and diversification in these sectors.

*“We only catch many fish when the river water enters into large ponds yearly. Fishermen depend on it.”*

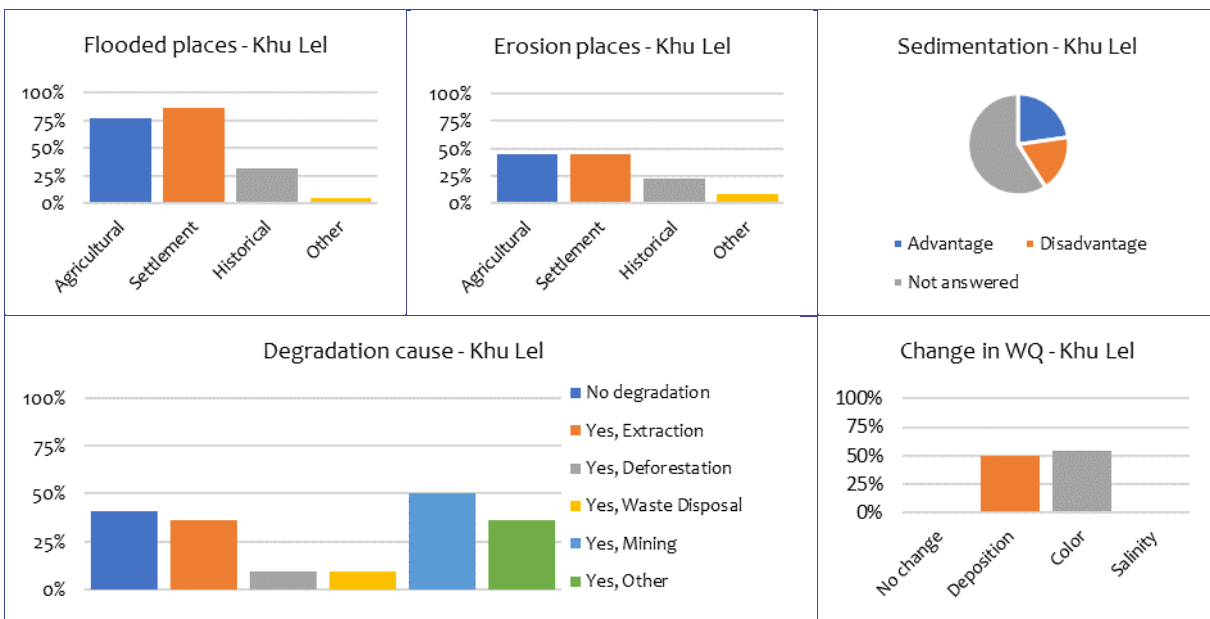
*“During floods, we have transportation problems and sluice gate problems at large ponds”*

*~ Farmer/trader from Khu Lel (26 August 2017)*





<b>DATE OF CONSULTATION</b>	26 August 2017
<b>NO. PARTICIPANTS</b>	39
<b>OCCUPATION</b>	Farmers, fishermen and merchants. Furthermore: one teacher and one health care professional.
<b>BIGGEST VALUES</b>	Irrigation, drinking water, fishing
<b>BIGGEST PROBLEMS</b>	Flooding, solid waste, drinking water
<b>HOT TOPICS</b>	Irrigation, fertile alluvial soils, cultural & religious values



Villagers who came to community session



Discussion with villagers



Villagers investigate problems, values & maps



Question and answers with villagers



Reporting issues on satellite map



Feedbacks and reports from villagers

4.6.2 Nga Pyin Inn

Nga Pyin Inn village earns its income primarily from farming and fisheries. The **floods** are a problem. For two months per year, no fishing or farming is possible. The current floods resulted in much loss of crops. Children have problems reaching their schools and parents need to wade through the water to support them. Access to the village is difficult, as well. The roads are in poor condition, and navigation is not easy. The people indicate that they are in need of basic amenities such as **infrastructure** and **electricity**. **Drinking water** is taken from the river. During floods, the quality of the drinking water deteriorates. To get better control over the floods and their effects such as lower drinking water quality, the villagers mentioned that they want to regulate the **drainage system** by installing a sluice at the inlet near Khu Lel. This way the villagers hope to be able to evacuate surplus of water more easily, and improve retention and irrigation capacity during the dry season. **Sanitation** is considered a value of the river, because domestic toilets can be flushed and discharged onto the river. Most of the households have their own toilet, but during floods, some are destroyed.



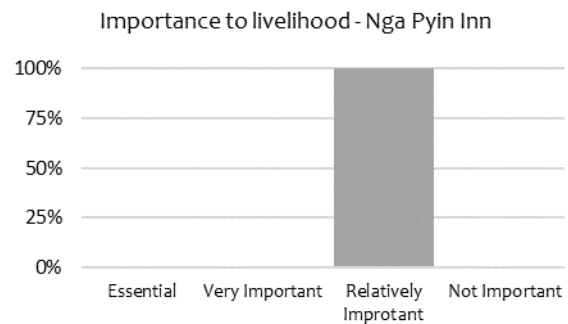
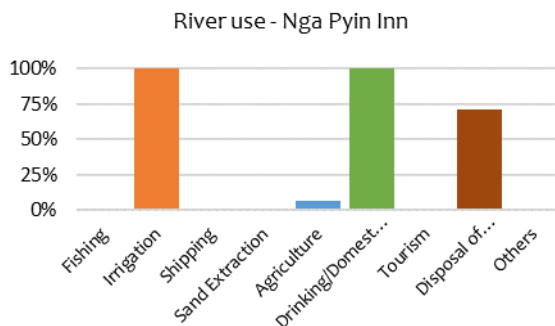
**Future dreams:** The villagers say that they are comfortable in their village, and look at the future with confidence. If the infrastructure is improved and electricity becomes available, they expect growth, in particular in farming.

*“In our area, we don’t collect water from water wells. Therefore, we depend on river water.”*

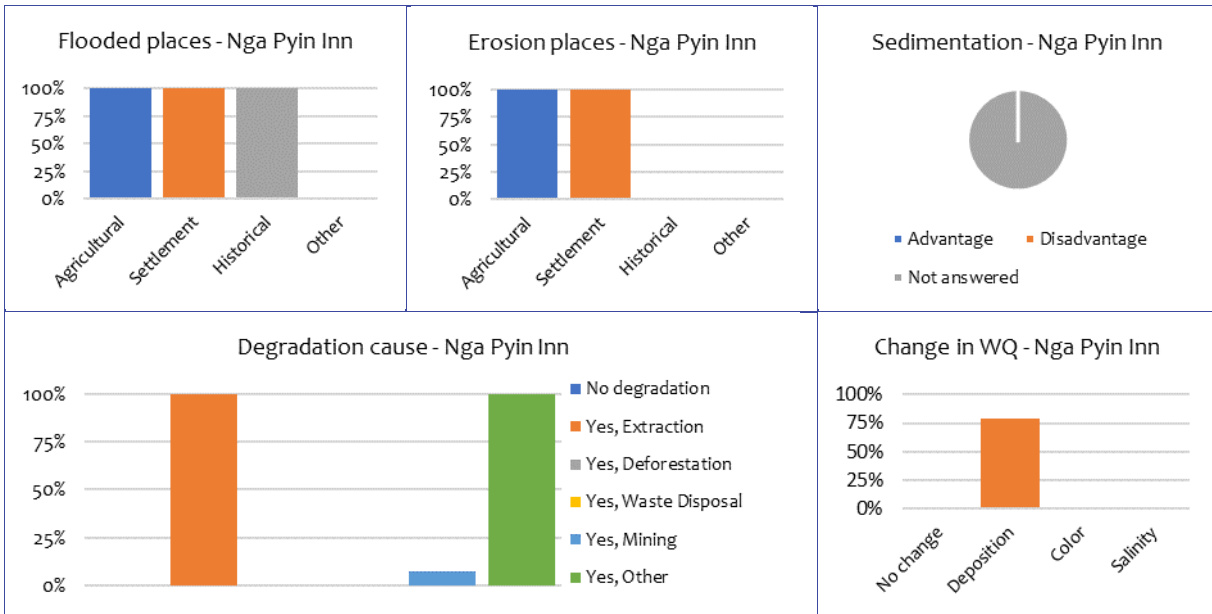
*“The river water is no problem for adults, but sometimes our children get sick.”*

*“Toilets are destroyed during floods, so we have to rebuild our toilets every year.”*

~ Farmer from Nga Pyin Inn (26 August 2017)



<b>DATE OF CONSULTATION</b>	26 August 2017
<b>NO. PARTICIPANTS</b>	202
<b>OCCUPATION</b>	n.a.
<b>BIGGEST VALUES</b>	Sanitation, drinking water, navigation
<b>BIGGEST PROBLEMS</b>	Flooding, drinking water
<b>HOT TOPICS</b>	Infrastructure, electricity, drainage system



Discussion with boat owners



Villagers who came to community session



Question and answers with villagers



Feedbacks and reports from villagers



Villagers investigate problems, values & maps



Group photo with villagers



### 4.6.3 2<sup>nd</sup> Ward

The 2<sup>nd</sup> ward of Singu Township is located just upstream of where the inland delta starts. People told us that there are **no major issues** with the river in their village. **Drinking water** is taken from the river. It used to be clearer; nowadays it is a bit more turbid, but still good for consumption, although people prefer purified water. A pumping station is used to extract water from the river. **Fishing** takes place for two months per year. The catch is good but less than it was 10 years ago. According to the villagers, this could be caused by new methods such as electrical battery fishing and the use of chemicals. The river provides **sanitation** to the village. People are happy that they can relieve themselves directly in the river. Toilets discharge to the river, as well. The river has a **cultural and religious** significance to the village. Every year, there is a festival to celebrate a Buddhist tradition in which a monk is honored. He is associated with the sea and river. The celebration highlights a boat moving around with a thousand candles on it. Some minor issues are mentioned like seasonal **flooding** and **bank erosion** due to floods and wave action from high-speed passenger vessels. Two small nearby villages were forced to **relocate** because of erosion. Also, **pollution** was mentioned as a minor issue, not because of industries but, in particular, local sources like domestic waste. Compared with the past, large quantities of plastic have become a larger problem. Some minor conflicts between townships and villagers occur on newly created alluvial fertile lands when these lands are located on administrative boards.



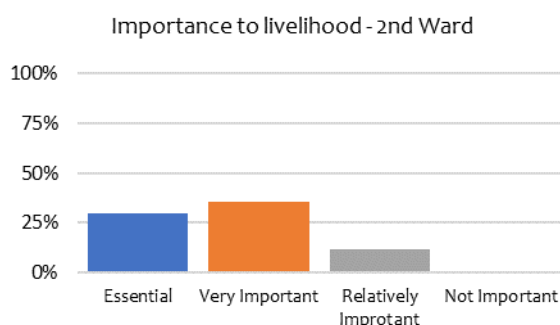
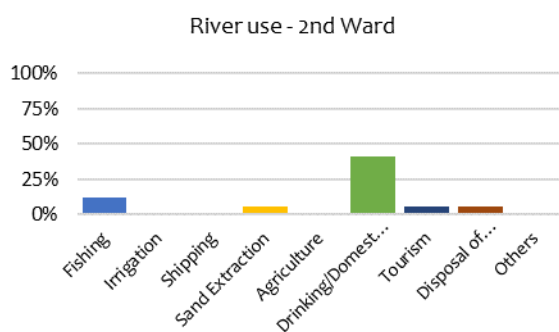
**Future dreams:** The future is believed to be bright. Not much change is expected in the coming 10 years. Will the children stay in this village? Villagers told us, “We don’t know. Some might leave, others might stay.”

*“Ayeyarwady River is life line of Myanmar. A lot of people depend on this river.”*

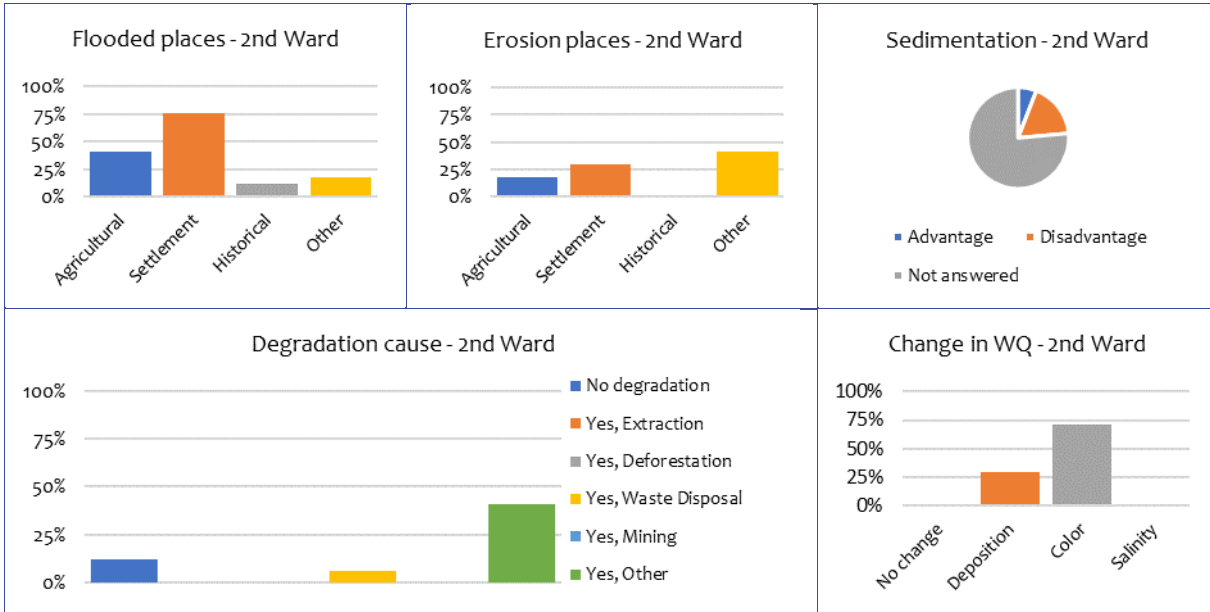
*“I named my first daughter ‘Ayeyarwady’ after the Ayeyarwady River because of its beauty and importance.”*

*“Ayeyarwady River wouldn’t last long if we take more than the nature can give to us.”*

~ Mr. Luu Min, actor present at 2<sup>nd</sup> Ward (25 August 2017)



<b>DATE OF CONSULTATION</b>	25 August 2017
<b>NO. PARTICIPANTS</b>	55
<b>OCCUPATION</b>	Manual laborers (such as carpentry, cleaning and washing). Also some fishermen, merchants and teachers.
<b>BIGGEST VALUES</b>	Drinking water, fishing, navigation, sanitation
<b>BIGGEST PROBLEMS</b>	Flooding, solid waste
<b>HOT TOPICS</b>	Bank erosion, pollution



Interview with actor Lu Min



Villagers who came to community session



Discussion with villagers



Reporting issues on satellite map



Villagers investigate problems, values & maps



Feedbacks and reports from villagers



## 5 HYDRO-ECOLOGICAL ZONE: LOWER AYEYARWADY

### 5.1 Location of HEZ in Ayeyarwady River Basin

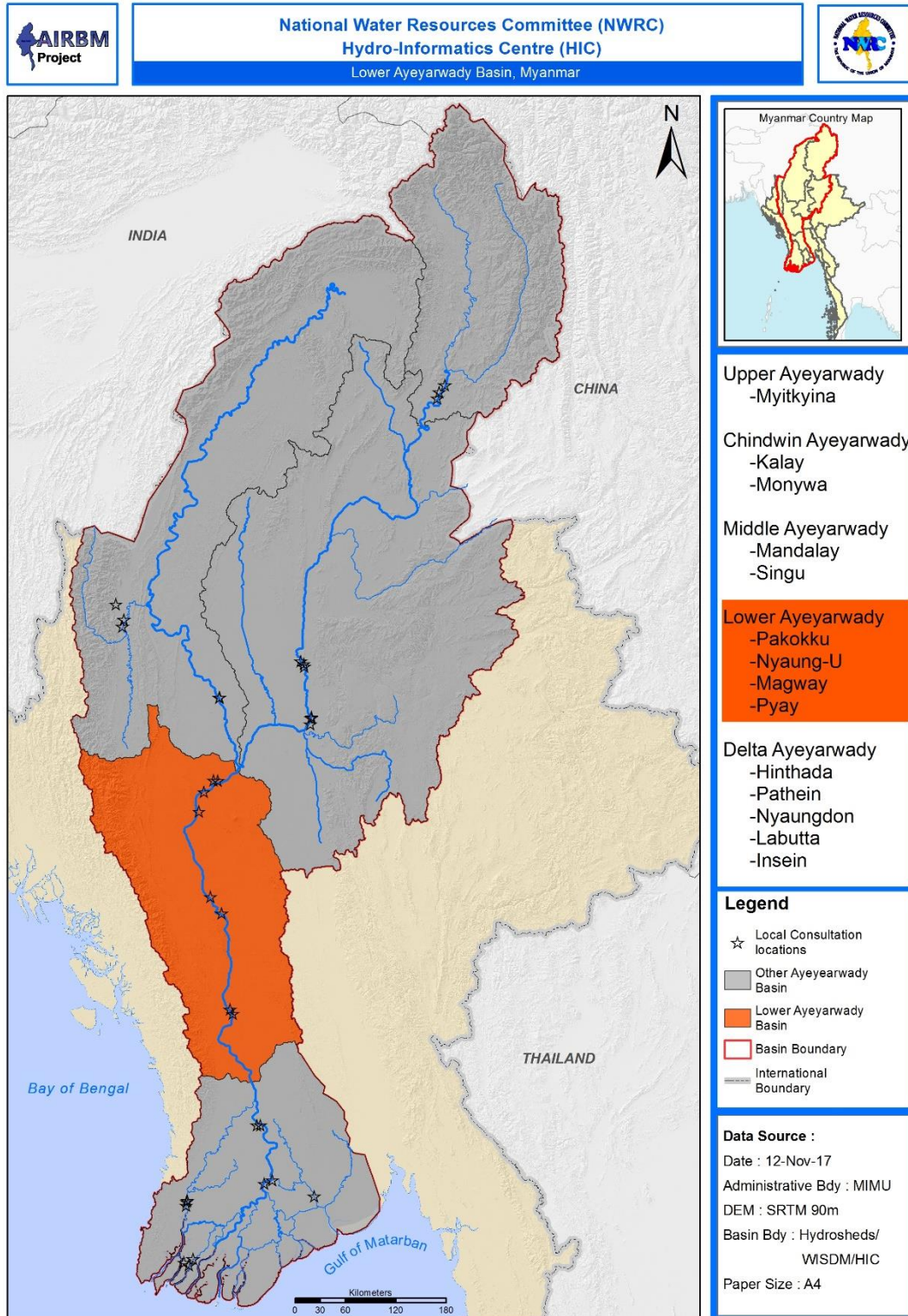


Figure 28 - Location of the Lower Ayeyarwady HEZ in the Ayeyarwady River Basin



5.2 Issues in Lower Ayeyarwady

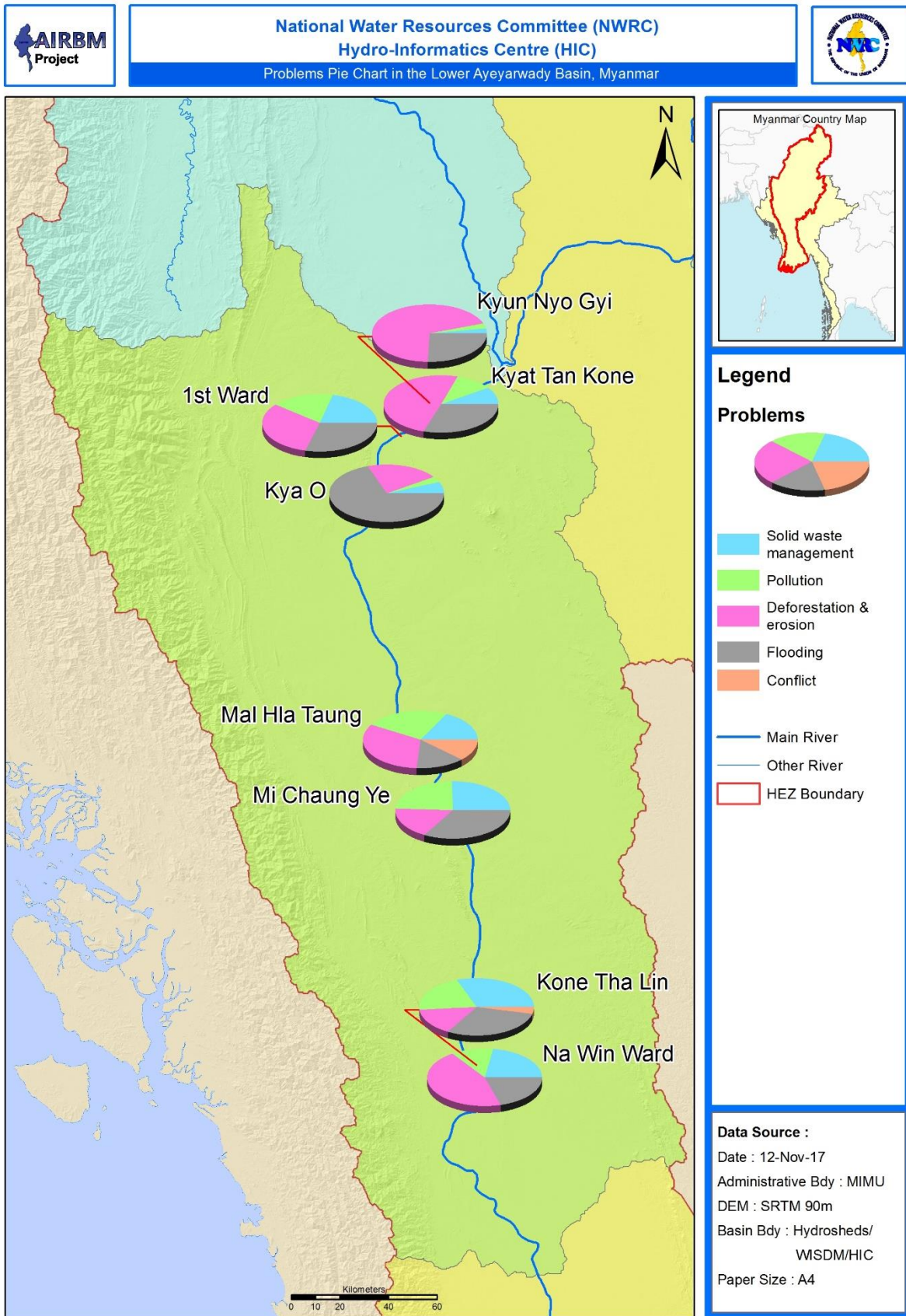


Figure 29 - Issues in Lower Ayeyarwady HEZ, as indicated by villagers in Nyaung U, Pakokku, Magway, and Pyay townships

5.3 Values in Lower Ayeyarwady

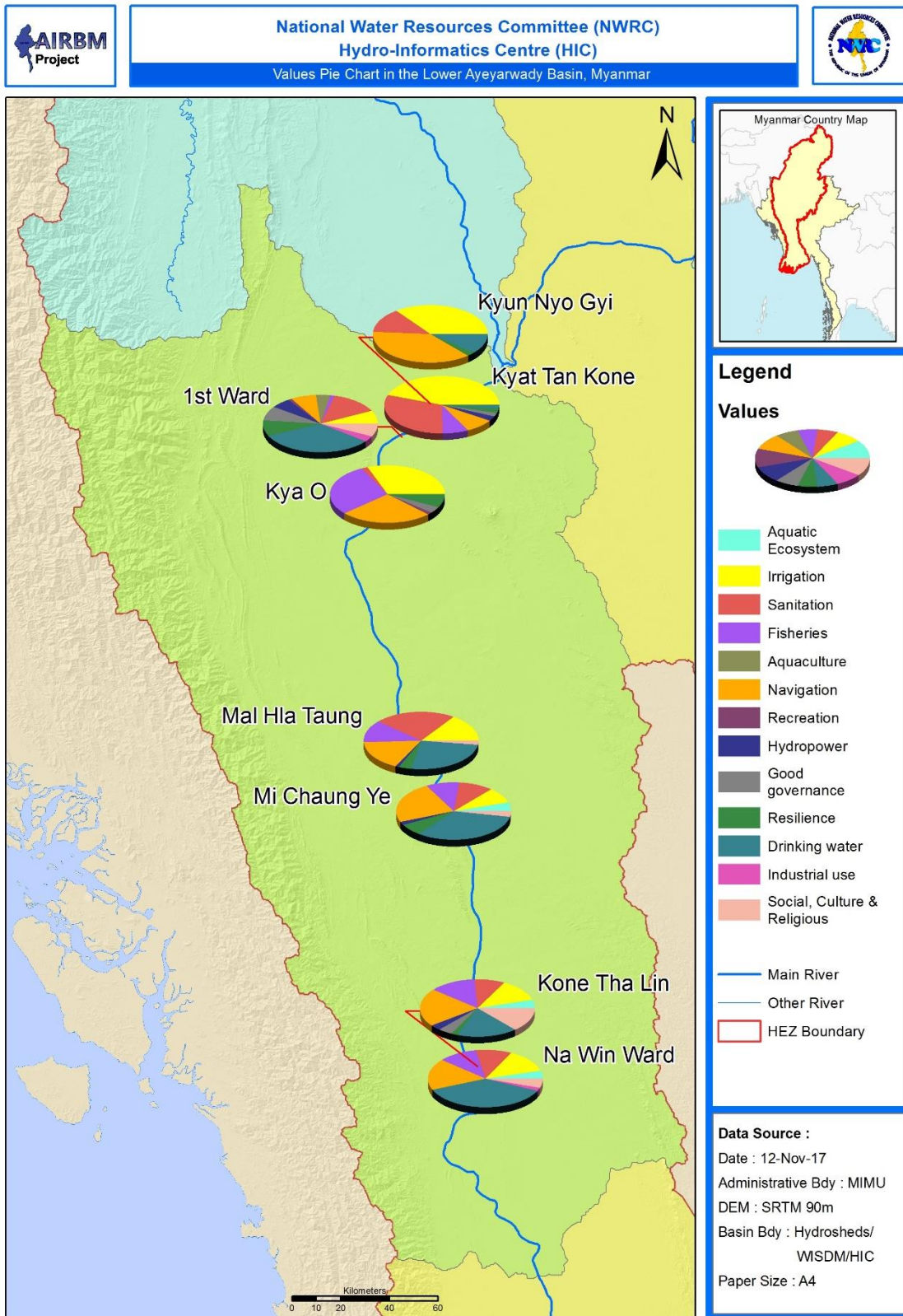


Figure 30 - Values Lower Ayeyarwady HEZ, as indicated by villagers in Nyaung U, Pakokku, Magway, and Pyay townships





Figure 31 – Impression of living along the Lower Ayeyarwady River



## 5.4 Magway Township

### 5.4.1 Mal Hla Taung

In Mal Hla Taung, approximately 25% of the village is flooded yearly for approximately one month. This is **seasonal flooding** and people do not think it has become worse, although the flooding causes all kinds of nuisances. They do not move because they are too poor to afford anything else. Also, the heavy rainfall and floods are causing **erosion** of the cultivated land, so erosion is a problem because of the loss of agricultural land. The villagers are very cheerful, but the most important issue is a **conflict** with regard to **ownership of farmland**. In the time before the last elections, farmland was sold to the regional government who provided it to others who are obviously not using the land, according to the villagers. They want to buy their land back so that they can grow vegetables on this very fertile soil, improve their livelihoods, and deal with the effects of flooding. The only problem is that they need proof of previous ownership, which did not exist at the time. Communication with the government is still difficult and requires time, but in the end the villagers hope that the new government will help them in this conflict of land ownership.



Another, seemingly older, conflict is who gets the right to till **the alluvial islands**. The islands move every year, so it is difficult to establish which village owns them, or is entitled to use them. **Pollution and solid waste** are issues as well. Other people throw garbage into the river; these villagers burn their waste. Their preferred solution is that the government **prohibit littering**. Another issue is **drinking water**. People do not own their own well. Pumping water, including for agriculture, is expensive because it requires fuel. **Sanitation** is an issue because toilets are not working in times of flooding and they bath in the river among the solid waste.

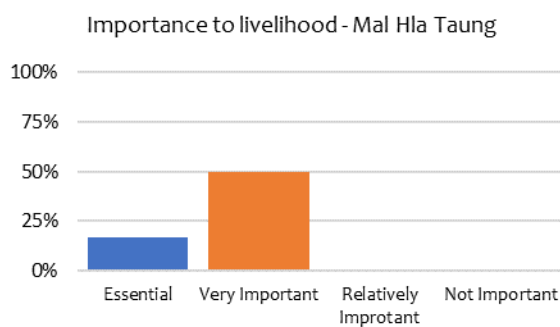
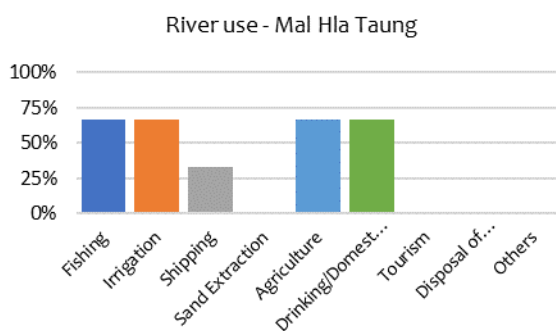
**Future dreams:** Villagers hope that the young generation will stay in this village; however, there must be more job opportunities, otherwise they will have no future. “Children should always live where there are the most opportunities.”

**“We lost a lot of farmlands since last 12 years due to erosion.”**

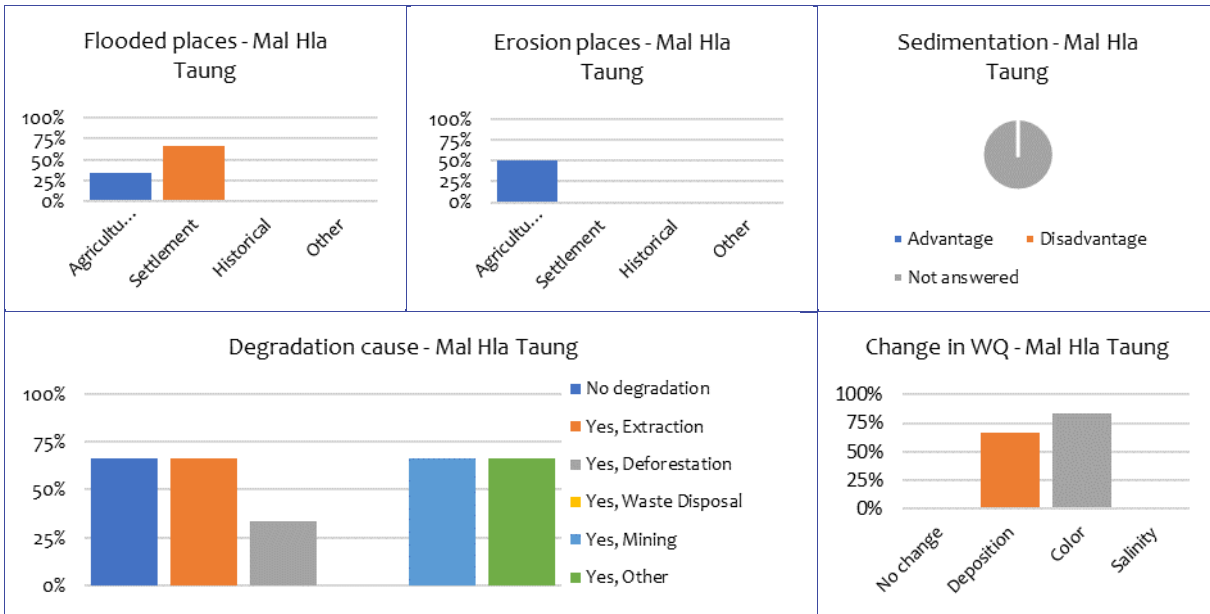
**“Village has to relocate once per 10 years, 4 years, or even every year.”**

**“When flooded, it is difficult to get drinking water. We need to find other sources.”**

~ Farmer from Mal Hla Taung (20 July 2017)



<b>DATE OF CONSULTATION</b>	20 July 2017
<b>NO. PARTICIPANTS</b>	69 (approximately 55% women and 45% men)
<b>OCCUPATION</b>	n.a.
<b>BIGGEST VALUES</b>	Irrigation, fishing
<b>BIGGEST PROBLEMS</b>	Flooding, drinking water, solid waste management
<b>HOT TOPICS</b>	Ownership of farmland, sanitation



Discussion with villagers



Questions and answers with villagers Villagers investigate problems, values & maps



Questions and answers with villagers



Kids studying the discussion



Investigating drinking and domestic water in village



5.4.2 Mi Chaung Ye

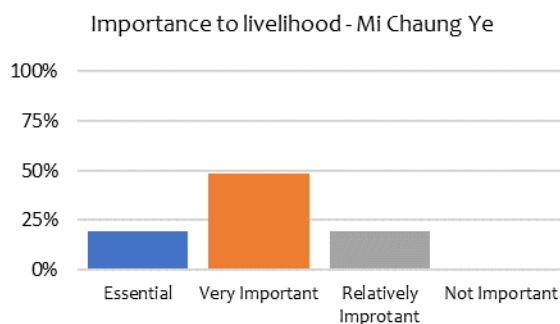
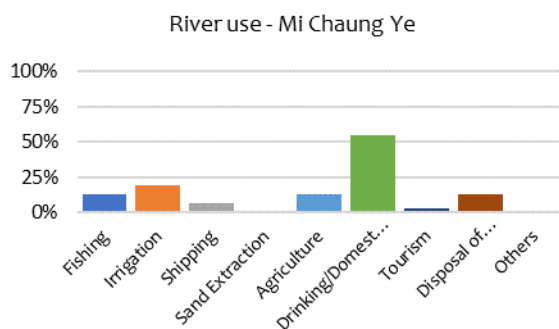
The Mi Chaung Ye village has 880 households, and 300 houses are in immediate danger of **flooding**. People stay in this place because they have no choice; their ancestors also lived here and seasonal flooding is something these villagers are used to. The problem, though, is that the seasonal flooding is becoming worse and worse. The flooding occurs every year, instead of every couple of years. The duration of the flooding is approximately one month. And although they are used to it, flooding causes problems, like **sanitation, education, loss of livelihood** and a larger risk of **poisonous snakes**. **Flooding** is caused by deforestation and climate change. The people explain that some rich people build private retaining walls, which are mostly effective in stopping erosion, but not flooding. Also, the river is becoming shallower due to **sedimentation** caused by upstream **gold-, sand- and gravel mining**. The sediments that are loosened by the digging are discharged in this part. The most important water value is **drinking water** from the river. They cannot drink water from the tube wells, due to **salination**. They use rainwater that they harvest from their roofs. The **quality of the river water** is decreasing because of **turbidity** during rainy season and pollution caused by lack of **solid waste management**. **Fishing** is also important and the people acknowledge their own role in the deterioration of the fish population. They state that there are ever more fishermen, and ever fewer fish. This is caused by exploitation of the fish population during spawning season. They would like to wait until the fish are bigger, but when they do wait, all the fish will have been caught. A real solution would be other job opportunities: there are simply too many fishermen, according to the villagers. The fishermen present do have odd jobs, but those jobs are seasonal and not alternative for fishing. The Ayeyarwady River is also important for **river transportation**; better access routes might provide more job opportunities. **Resilience** is an important value; local government, non-governmental organizations (NGOs), and people help each other during floods.



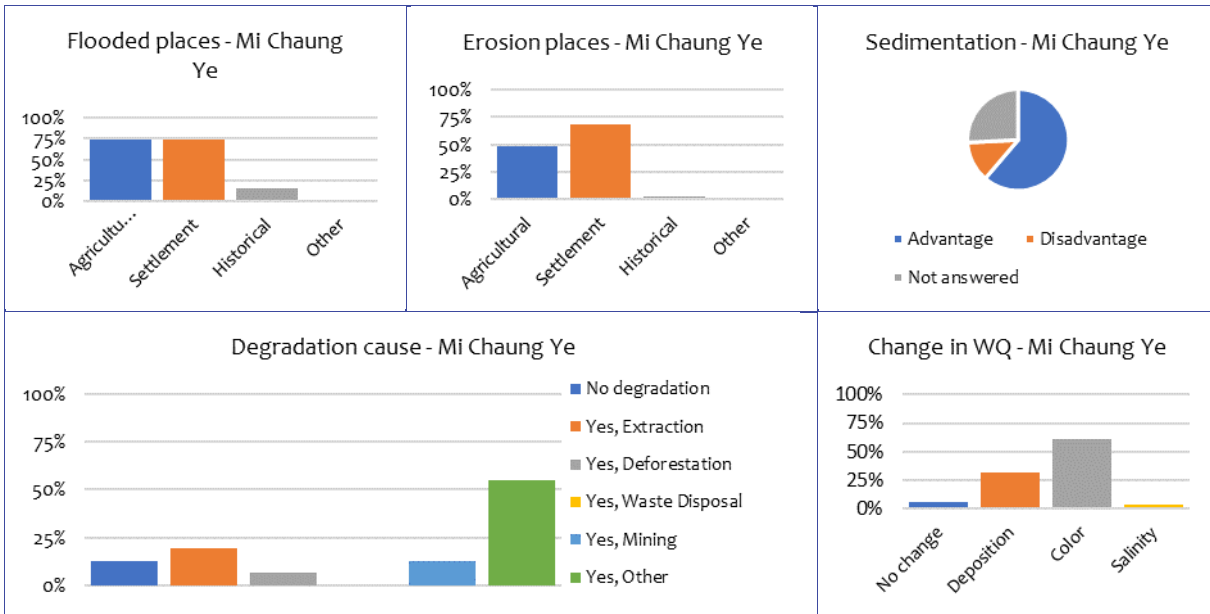
**“The Ayeyarwady River connects Myanmar. I wish good navigation will help the country to develop. It is very important. Sand banks are a major problem now.”**

**“Deforestation is the main reason for erosion and for flooding.”**

~ Electrical worker from Mi Chaung Ye (20 July 2017)



<b>DATE OF CONSULTATION</b>	20 July 2017
<b>NO. PARTICIPANTS</b>	33 (approximately 90% men and 10% women)
<b>OCCUPATION</b>	Manual laborers, farmer
<b>BIGGEST VALUES</b>	Drinking water, sanitation
<b>BIGGEST PROBLEMS</b>	Flooding, drinking water, river water quality
<b>HOT TOPICS</b>	Loss of livelihood, poisonous snakes, salination, waste management



Meeting at GAD office



Discussion with villagers



Discussion with villagers



Villagers investigate problems, values & maps



Explanation and discussion with 3D map



Questions and answers with villagers



## 5.5 Nyaung-U

### 5.5.1 Kya O

In Kya O village, **flooding** is the main problem, which is causing health issues like diarrhea. Fifteen years ago, part of the people moved to this specific area because of flooding in another location. They believe the floods are caused by sedimentation and large discharges from the upstream area. Flash floods are their largest issue. The villagers believe that it is raining harder than before, and “the water cannot go away”. **Erosion** of dams is an issue, as well. **Resilience** is considered to be a value by the villagers; the people help each other to build temporary shelters. A few years ago, the government provided the village a dam, but it is not functioning well. The people would prefer to **relocate** the entire village to a safer place. They know some suitable unused **land** but the prices are too high and **land ownership** complicates the situation with the government and the land owners. If they cannot move to a better place, they want a functioning dam. The local government said they cannot afford improvements to the dam. During floods, which last approximately one month, they cannot work in agriculture or tend to livestock. They grow mainly vegetables such as onions. The people **irrigate** with river water, and on some areas further away from the river they use ground water. **Fishing** is also an important source of income. Fishing is difficult in times of high discharge. There are fewer fish because of the upstream use of batteries and fishing in the spawning season. Flooding also causes problems for **education**. The children must be taken to school in boats, and this is expensive and difficult.



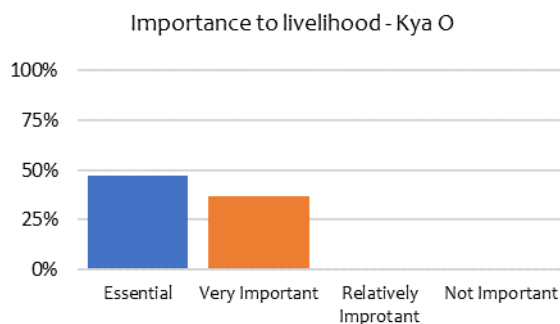
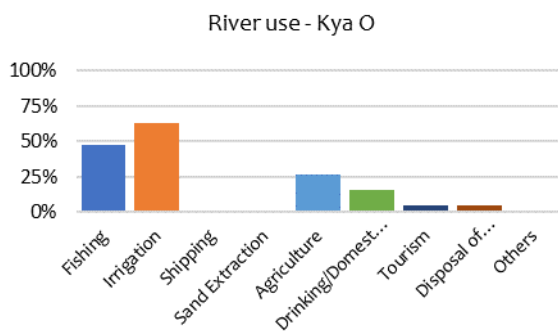
**Future dreams:** Education is the key to a better future. Young people leave for the big city, in this case Mandalay. The entire village would like to move so that their children can return home.

*“Myaung flood combined with Ayeyarwady River flood is the real problem for us.”*

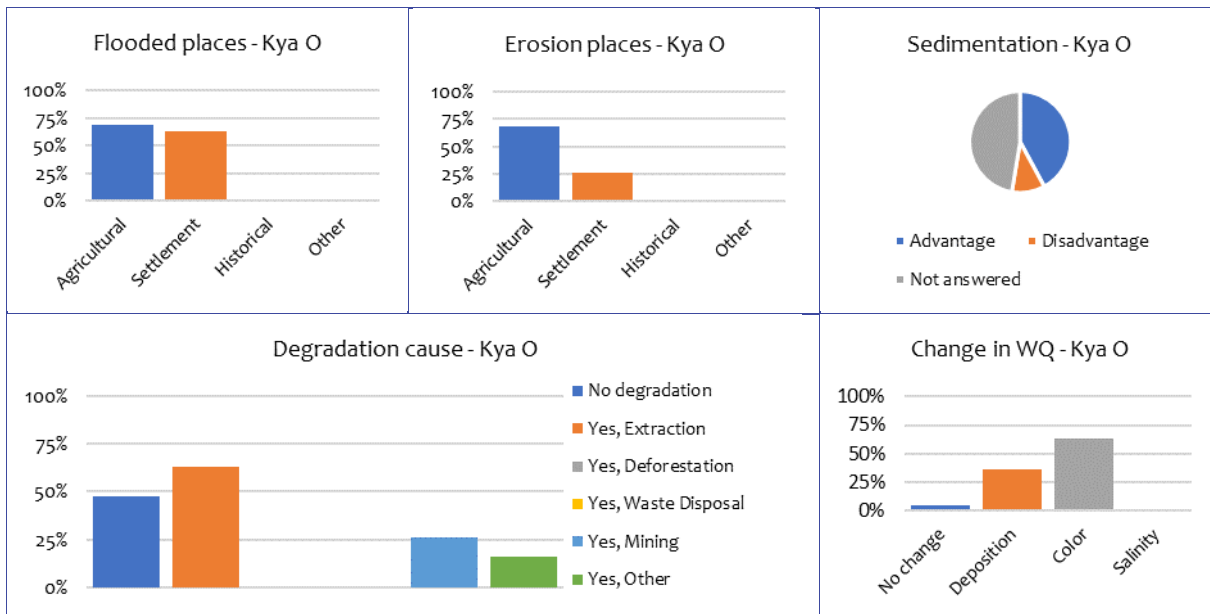
*“Government developed embankment, but floods still occur.”*

*“We wish government relocate our village to somewhere safe from flood.”*

~ Farmer from Kya O (17 July 2017)



<b>DATE OF CONSULTATION</b>	17 July 2017
<b>NO. PARTICIPANTS</b>	185 (approximately 70% women and 30% men)
<b>OCCUPATION</b>	Farming, fishing
<b>BIGGEST VALUES</b>	Irrigation, navigation, fishing
<b>BIGGEST PROBLEMS</b>	Flooding, erosion
<b>HOT TOPICS</b>	Resilience, land ownership



5.5.2 1<sup>st</sup> ward

The most important value in the 1<sup>st</sup> Ward of Nyaung U is **drinking water**. The ladies are quite content with the quality of the drinking water from the river. The quality remains good, until there is a lot of discharge from upstream. A crystal is used to clear the water. The main problem in this area is **solid waste**. The villagers believe they do not have enough waste collection points, so they see no alternative other than dumping it in the river. Pollution is also caused by dead animals and the **lack of sanitation**. The pollution causes **health** issues like diarrhea. The most important problem is **flooding**. They hve observed considerable deterioration over the last three years, with the worst case of flooding in 2016. The average flood happens twice per year and lasts about 21 days. During the flooding everyone stays at home and waits for conditions to improve. There seems to be some sort of **relief** agency to help the villagers, although there is discontent about the distribution of goods. Not all of the women received their share. People say that they help one another in times of floods. According to the villagers, **climate change** and **deforestation** in Northern Myanmar are the main causes. Floods can be solved, in their opinion, by a retention wall. **Navigation** is also a value and has become more difficult due to **sedimentation** in the river. The navigation channel becomes narrower, thereby hindering bigger ships.



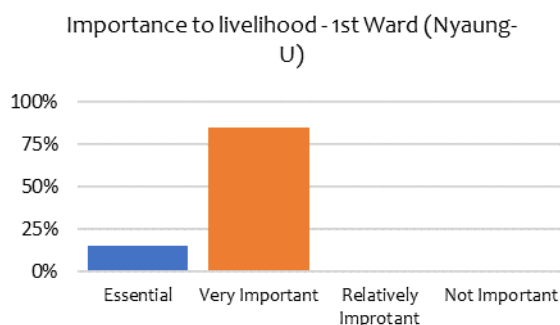
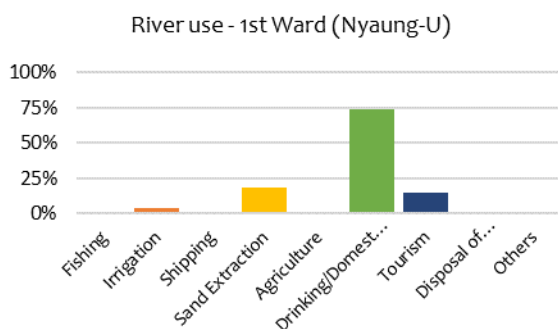
**Future dreams:** Family life is very important. Without flooding, life is good in this neighborhood. People hope that the younger generation will stay in the village.

*“Every year, during floods, drinking water is dirty.”*

*“Difficult navigation during dry season causing negative impacts on our economy as well.”*

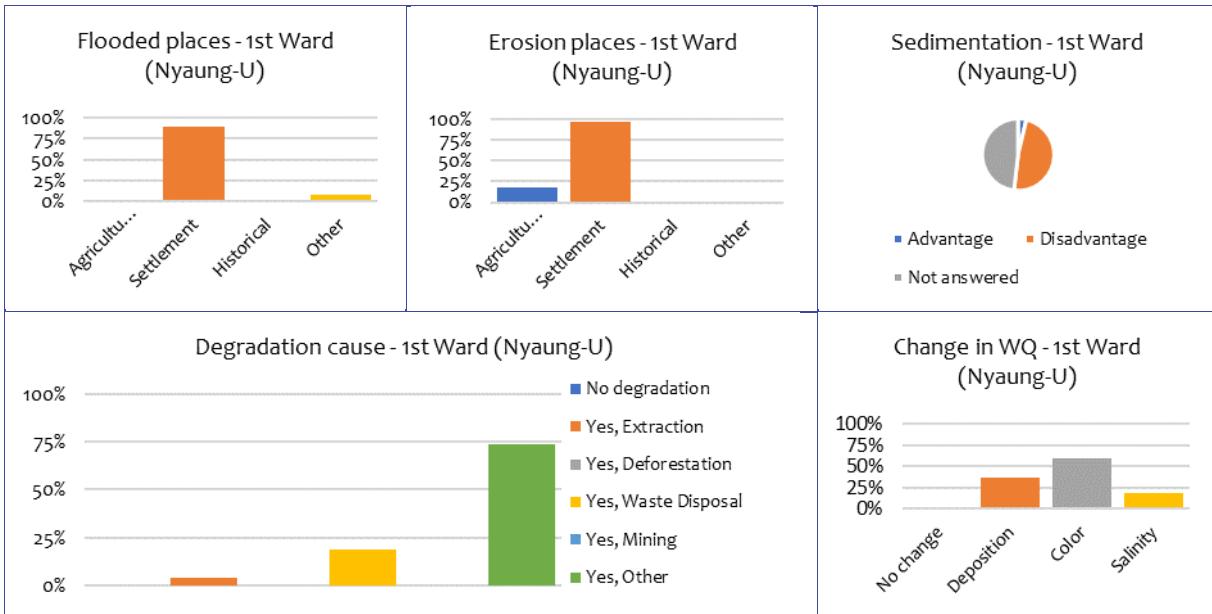
*“We all have many troubles with floods.”*

*~ Housewife from 1st ward (17 July 2017)*





<b>DATE OF CONSULTATION</b>	17 July 2017
<b>NO. PARTICIPANTS</b>	111 (approximately 75% women and 25% men)
<b>OCCUPATION</b>	n.a.
<b>BIGGEST VALUES</b>	Drinking water
<b>BIGGEST PROBLEMS</b>	Flooding, solid waste management
<b>HOT TOPICS</b>	Drinking water, health issues



Ward (1) GAD office



Villagers who came to community session

Discussion with villagers



Villagers investigate problems, values & maps



Reporting issues on satellite map



House wives also came and discuss interestingly

## 5.6 Pakokku Township

### 5.6.1 Kyun Nyo Gyi

Many houses in Kyun Nyo Gyi village are in danger of **flooding**. The people explain that flooding is partly seasonal: it has always been a problem. Floods last for 1 to 3 months. Some people have “long legged houses”, so they can move to the upper floors during floods. The base of their house is affected, so they do experience damage. The villagers mention byproducts of flooding, like **navigation**. During the flood season people need boats to get around; boats are expensive because they need to be rented. Only one out of ten families has a boat, so the people tend to become isolated during flood season. People earn their living with **agriculture**, especially vegetables and livestock, and jobs in the garment industry of Bagan. **Erosion** is a big issue caused by three related topics, according to the community; namely the “walking islands” in the middle of the river; the roads at the other side of the river and the bridge. Erosion has become much worse during the last couple of years and the bridge has been built in 2012. **Land ownership** is challenging; the villagers want to buy some neighbouring land for their houses and gardens but it turns out to be too expensive. They hope the government can help them, for example by allowing to build houses on farmland. The villagers dig canals to irrigate with river water. They do not use rainwater because they do not grow vegetables in the rainy season. River water, therefore, is important for **irrigation**. The harvests have deteriorated, though, due to exhaustion of the soil and insects. They use artificial **fertilizer**. **Education** and **awareness** on good practices is passed from between generations and based on information provided by the producers of fertilizers. **Drinking water** is problematic during flooding. People get their water from the tube wells, but during floods, the tube wells become inundated and people need to go to their neighbors, or depend on donations. The villagers also mention the need for more **transparency and accountability**. They want to be informed by the government about future plans and understand why certain decisions and measures are taken.

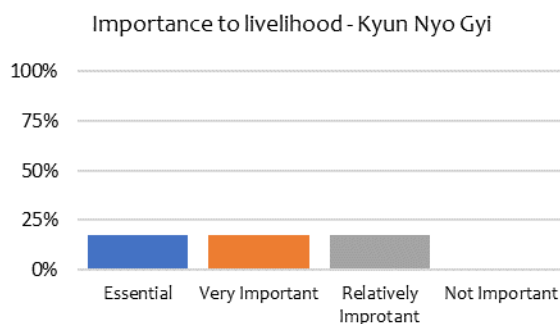
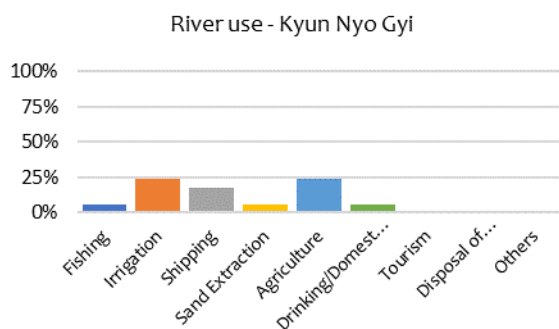


**“Nearly 70 families need to leave land due to erosion currently.”**

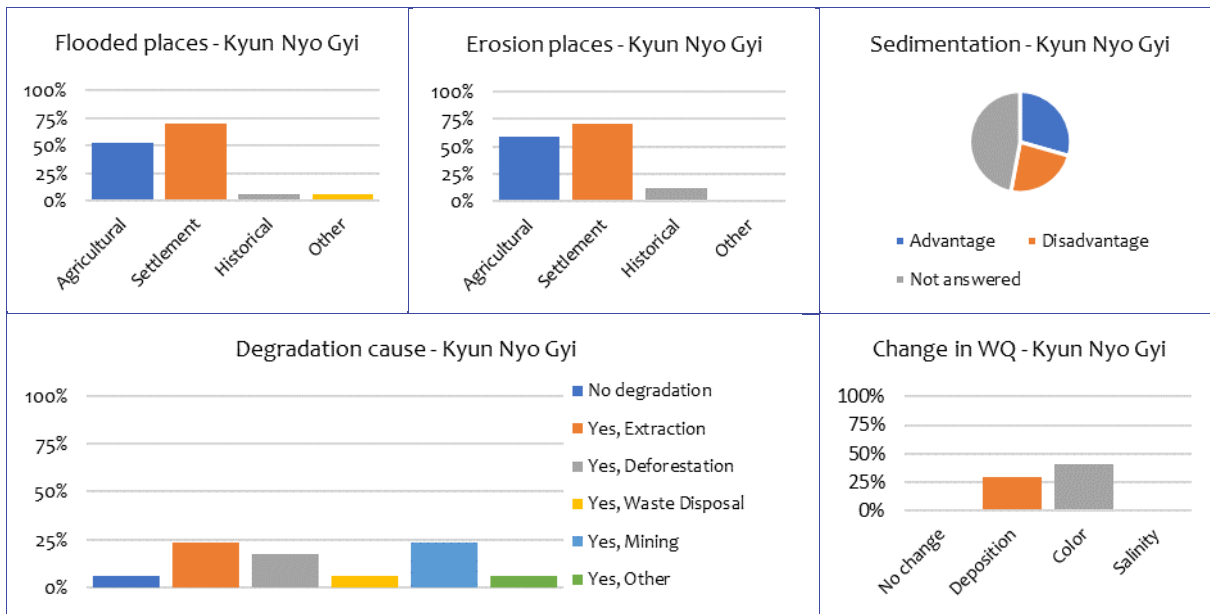
**“It is very expensive to buy land from land owners.”**

**“We wish government or donors arrange some land. We would like to relocate the entire village if possible.”**

~ Education officer from Kyun Nyo Gyi (18 July 2017)



<b>DATE OF CONSULTATION</b>	18 July 2017
<b>NO. PARTICIPANTS</b>	78 (51 women, 27 men and 25 children)
<b>OCCUPATION</b>	Farmers, manual laborers
<b>BIGGEST VALUES</b>	Navigation, irrigation
<b>BIGGEST PROBLEMS</b>	Flooding, erosion
<b>HOT TOPICS</b>	Land ownership, transparency and accountability



Discussion with villagers

Villagers investigate problems, values & maps

Questions and answers with villagers



Reporting issues on satellite map

Feedbacks and reports from villagers

Meeting at GAD office



5.6.2 Kyat Tan Kone

The area of Kyat Tan Kone is prone to **flooding**. Many villagers were relocated by the government when a bridge was constructed because the bridgeheads needed a lot of space. **Drainage** is a continuous issue, even in the dry season. Drains become clogged, which causes bad smells and **solid waste** is the main problem. The people hold the government responsible because the government relocated them to this new location, so the government should be required to provide solid waste collection, according to the villagers. The people from the village mainly suffer from **erosion**, caused in their opinion by the bridge, and from **floods**. The villagers do not want to move; in fact, they actually want to move closer to the river because of the fertile soil. The villagers ask for a retainment wall, just like the neighbor village. The government promised a retainment wall to both villages, but only the wall in the neighbor village has been built in time. The villagers were not involved in building the wall, and are dissatisfied with how it is functioning. For the time being, the villagers have made a temporary construction made of bamboo, together with the government. However, a permanent solution is required. **Erosion** is the main issue, according to the villagers. Also, **health issues** like malaria, diarrhea and skin problems, and lack of sanitation are issues, in particular during rainy season (e.g., toilets do not work).

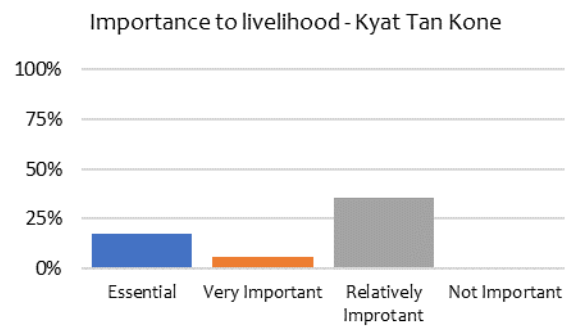
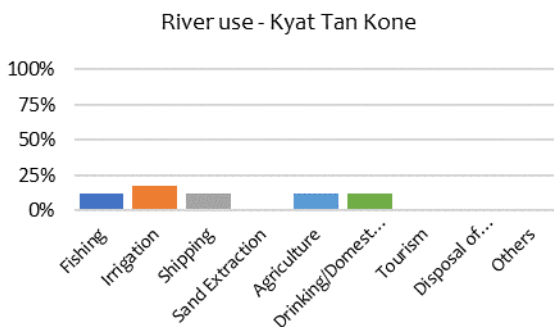


**Future dreams:** Villagers want a better environment for the children to grow up so they can become active and responsible members of their community.

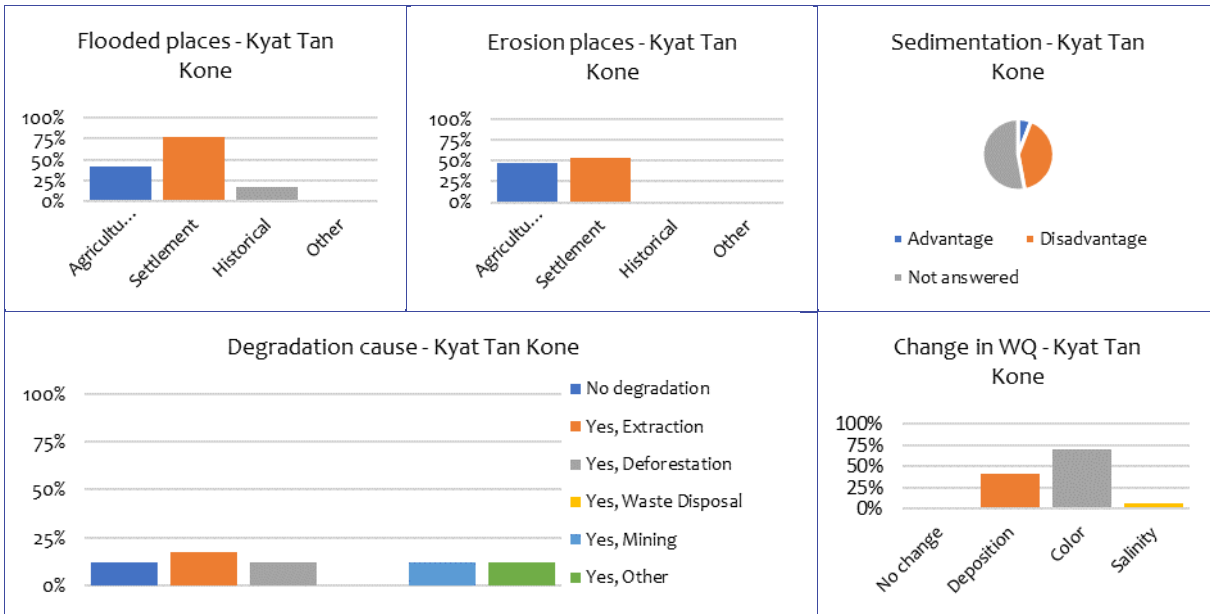
*“Our family moved this village since 2009. Last 4 years flood is more severe here and almost 3 metres high.”*

*“Floods start very quick and take 2 months because of garbage blocking and no drainage system.”*

~ Clothes maker from Kyat Tan Kone (18 July 2017)



<b>DATE OF CONSULTATION</b>	18 July 2017
<b>NO. PARTICIPANTS</b>	76 (approximately 65% women and 35% men)
<b>OCCUPATION</b>	Manual laborers, farmers
<b>BIGGEST VALUES</b>	Irrigation, sanitation
<b>BIGGEST PROBLEMS</b>	Erosion, flooding
<b>HOT TOPICS</b>	Drainage, solid waste, health issues



Villagers who came to community session



Discussion with villagers



Villagers investigate problems, values & maps



Questions and answers with villagers



Reporting issues on satellite map



Feedbacks and reports from villagers

## 5.7 Pyay Township

### 5.7.1 Kone Tha Lin

The most important water value in Kone Tha Lin is **drinking water**. They use river water for drinking. In the dry season this is fine; in the rainy season it becomes more problematic. The water becomes very muddy, and needs to be purified. They do this with traditional Nirmali seeds, known for their purifying quality. Other sources for drinking water are rainwater, gathered from roofs. They also have five tube wells in the village, but they cannot be used for drinking, only for domestic use. The groundwater has problems with salination. They further purify drinking water with chloride tablets and filters. Although measures are being taken, **health issues** still occur, like diarrhoea. The health issues are partly caused as a by-product of flooding, because the toilets spill over during floods. The toilets in this village discharge straight into the river, so this might cause health issues in many cases. **Flooding** is the most important problem in this village. Flooding causes damage to crops and erodes the river banks. Most importantly, the village is isolated during the period of seasonal floods, because they cannot use the road. The only means of transportation in this period is **navigation**. People with odd jobs, like farmers, try to go to work, the others stay at home. People do not move because it has always been like this. The floods themselves do not become worse, however, other effects like **erosion** and **pollution** do. The villagers have to rely on river water and rain; they do not have pumps and extract the water with buckets. They state that they do not use canals for **irrigation**, but there is a creek that takes river water to the land. **Fishing** as a livelihood is facing a problem with reduction in the amount of fish due fishing in the spawning season, use of batteries by other villagers, and the river becoming more shallow and influencing the fish habitat. A teacher explained about the importance of the **ecosystem**: the river is the home of birds, mammals and fish, and should be treated as such. There should be a better-balanced ecosystem. This balance is being disturbed by pollution. Pollution is caused by **solid waste** and discharges from the **factories** that are present in Pyay. There is an alcohol factory, a sugar factory, and another factory; by law, they should have waste water treatment. Better **data management and monitoring** is required.

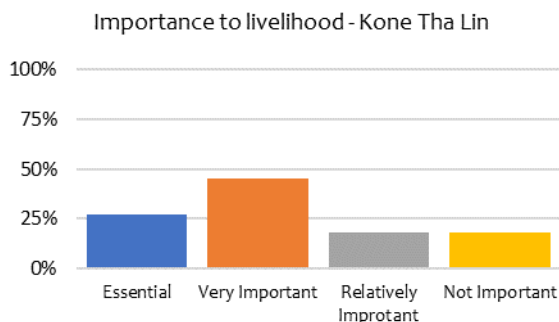
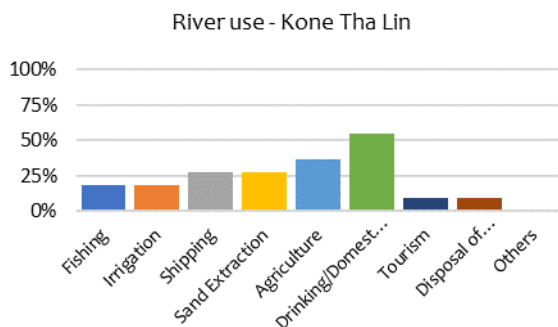


*“Ayeayrwady River has many benefits for the villages.”*

*“15 years ago, the water quality used to be very good compared to last years.”*

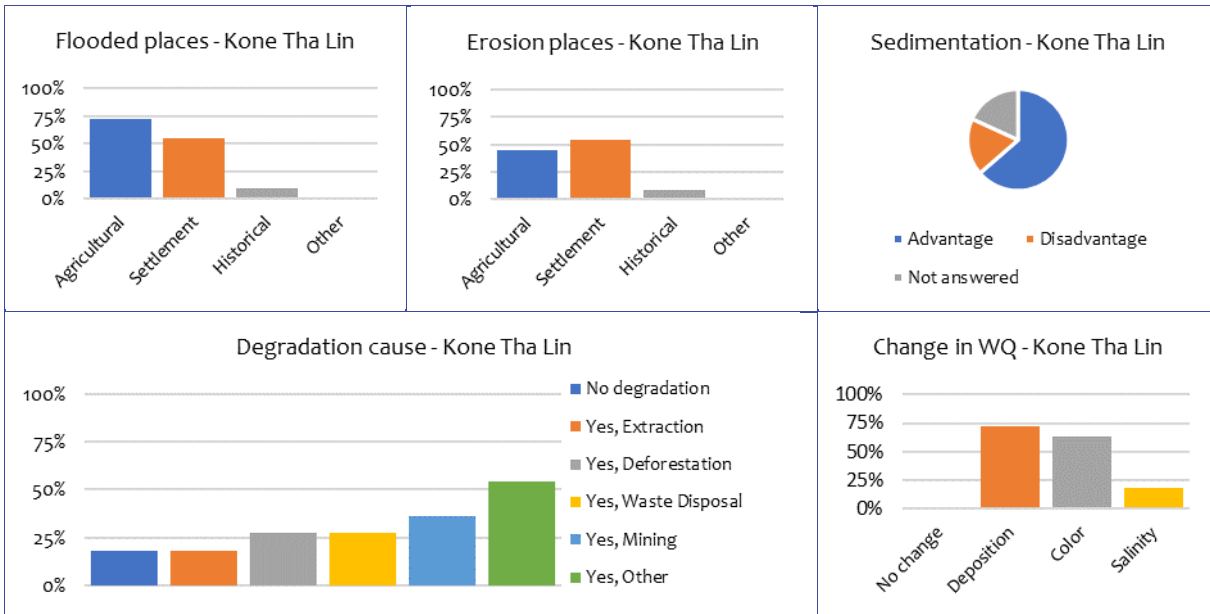
*“I am sharing knowledge about how to treat drinking water and more people are accepting this now.”*

*~ Assistant health officer from Kone Tha Lin (21 July 2017)*





<b>DATE OF CONSULTATION</b>	21 July 2017
<b>NO. PARTICIPANTS</b>	51 (approximately 45% women and 55% men)
<b>OCCUPATION</b>	Farmers, students
<b>BIGGEST VALUES</b>	Drinking water, navigation, fishing
<b>BIGGEST PROBLEMS</b>	Flooding, drinking water
<b>HOT TOPICS</b>	Health issues, solid waste, data management & monitoring



Kone Tha Lin Village GAD office

Villagers who came to community session

Discussion with villagers



Villagers investigate problems, values & maps

Feedbacks and reports from villagers

Students of Public Health are also participating

5.7.2 Na Win Ward

In Na Win Ward, the villagers explain that, for **drinking water**, they prefer the river water over groundwater or rainwater. The main problem is **flooding**. The people in this ward live in a low area prone to flooding. The seasonal flooding is becoming worse, and most people want to **relocate**. They were offered a plot higher up, but they do not want to move there because the farmland and roads are not good, in their opinion. During the floods, which last about 15 days and come once or twice per year, people either stay in their partly submerged houses, or they move to the monastery or a school. They can work a little bit, and some of their children can attend school. People need to borrow money for the education of their children. They borrow this money from each other, or by micro credit. When borrowing from their neighbours, interest rates can be more than twice as high as a micro credit. For micro credit, you have to be able to identify yourself and you need to create a small community of borrowers (10 people). This small community is responsible and if one of the members falls behind in paying back, the others will have to pay for him or her, resulting in **conflicts**. **Fishing** is also a big issue in this village; there are not enough fish due to fishing in the spawning season and the use of both poison and battery fishing. With regard to **cultural and religious values**, there is a special river Nat, who protects people from harm. The people perform offerings on a special altar near the river twice per year, before and after the monsoon. **Erosion** is an issue caused by **sand mining**. **Solid waste** causes problems, especially during flooding. The people admit that they are the cause; the waste collectors only come twice a week, and that is not enough, so they throw the waste into the river. Water **pollution** is not only caused by solid waste, but also by **industry**. These people also mention the factories, as they do not think factories have any waste water treatment plants.



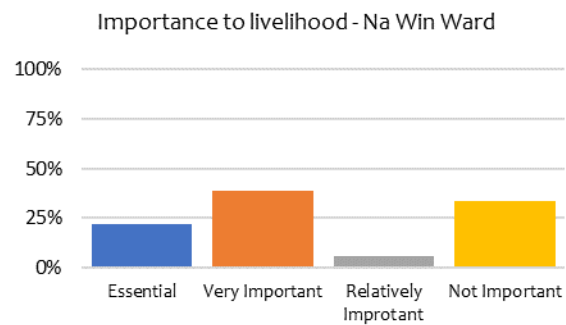
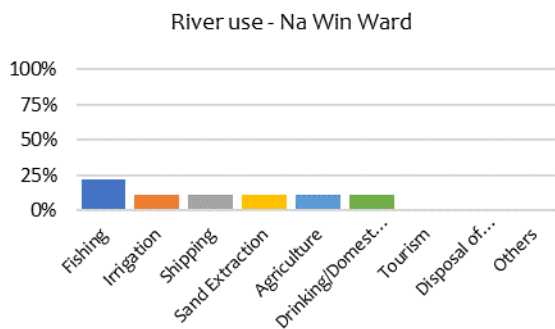
**Future dreams:** A mother we spoke with sobbed as she told us of her 4-year-old daughter who died during a flood last year. She had to leave to work, while her children took care of each other. The little girl fell into the water and drowned. The mother wants to move somewhere with a better and safer future for her remaining children.

*“People’s livelihood has been affected because of the floods since 5 years.”*

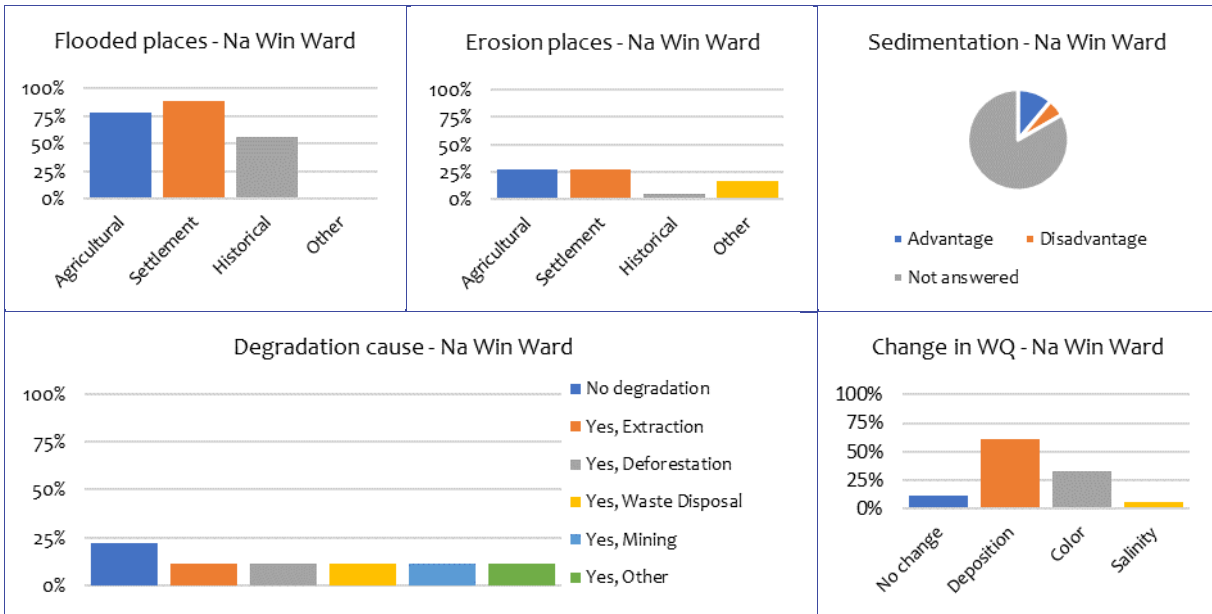
*“Sometime conflicts occur on available space at emergency camps during the floods.”*

*“We just have to treat some minor infection because of dirty water.”*

~ Nurse from Na Win Ward (22 July 2017)



<b>DATE OF CONSULTATION</b>	22 July 2017
<b>NO. PARTICIPANTS</b>	40 (approximately 80% men and 20% women)
<b>OCCUPATION</b>	Manual laborers, farmers and fishermen
<b>BIGGEST VALUES</b>	Drinking water
<b>BIGGEST PROBLEMS</b>	Flooding, solid waste
<b>HOT TOPICS</b>	Decreased fish, water pollution



Na Win Ward GAD office



Explanation and discussion with 3D map



Villagers who came to community session



Villagers investigate problems, values & maps



Reporting issues on satellite map



Meeting at GAD office



## 6 HYDRO-ECOLOGICAL ZONE: AYEYARWADY DELTA

### 6.1 Location of HEZ in Ayeyarwady River Basin

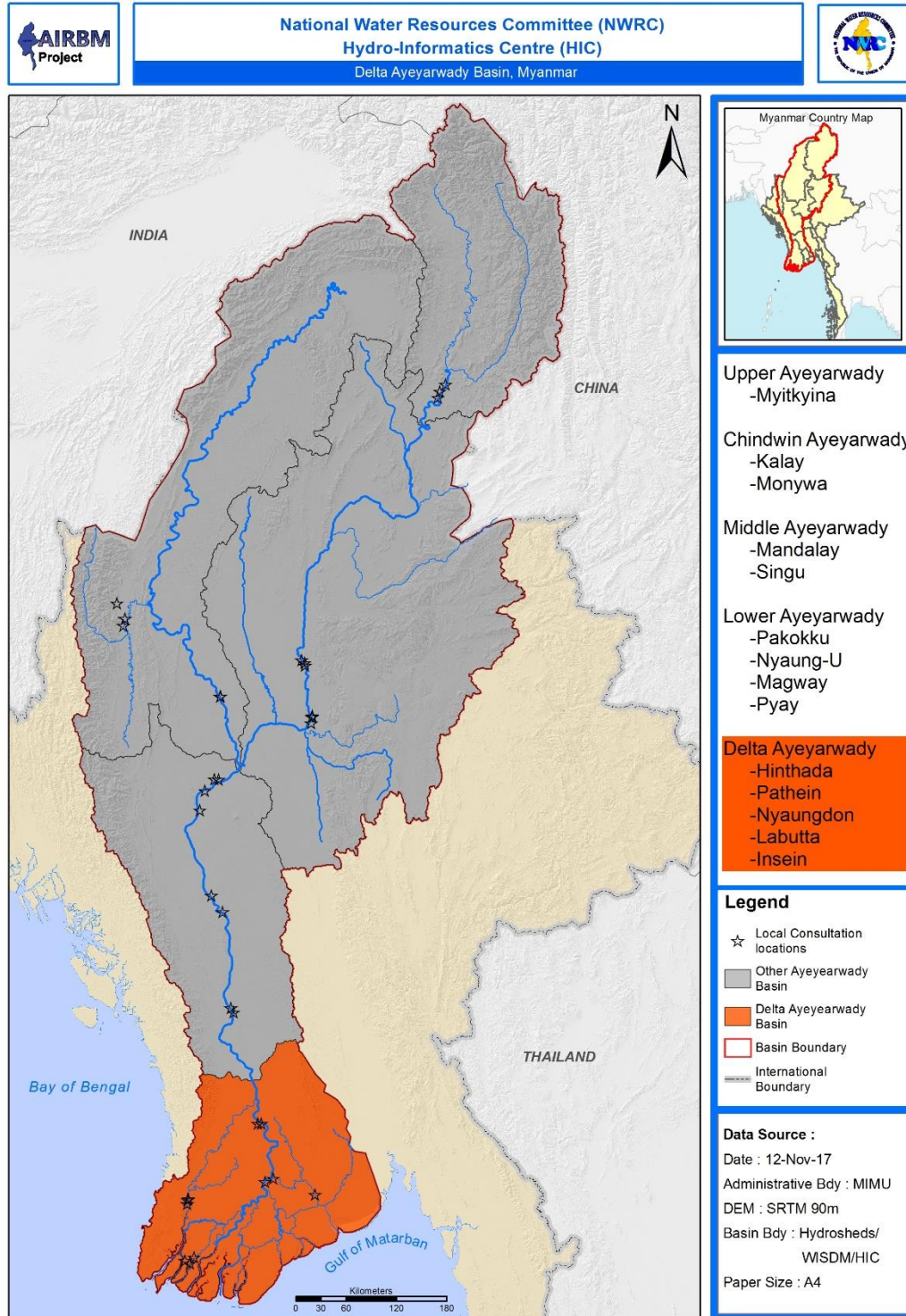


Figure 32 - Location of the Delta HEZ in the Ayeyarwady River Basin

6.2 Issues in Ayeyarwady Delta

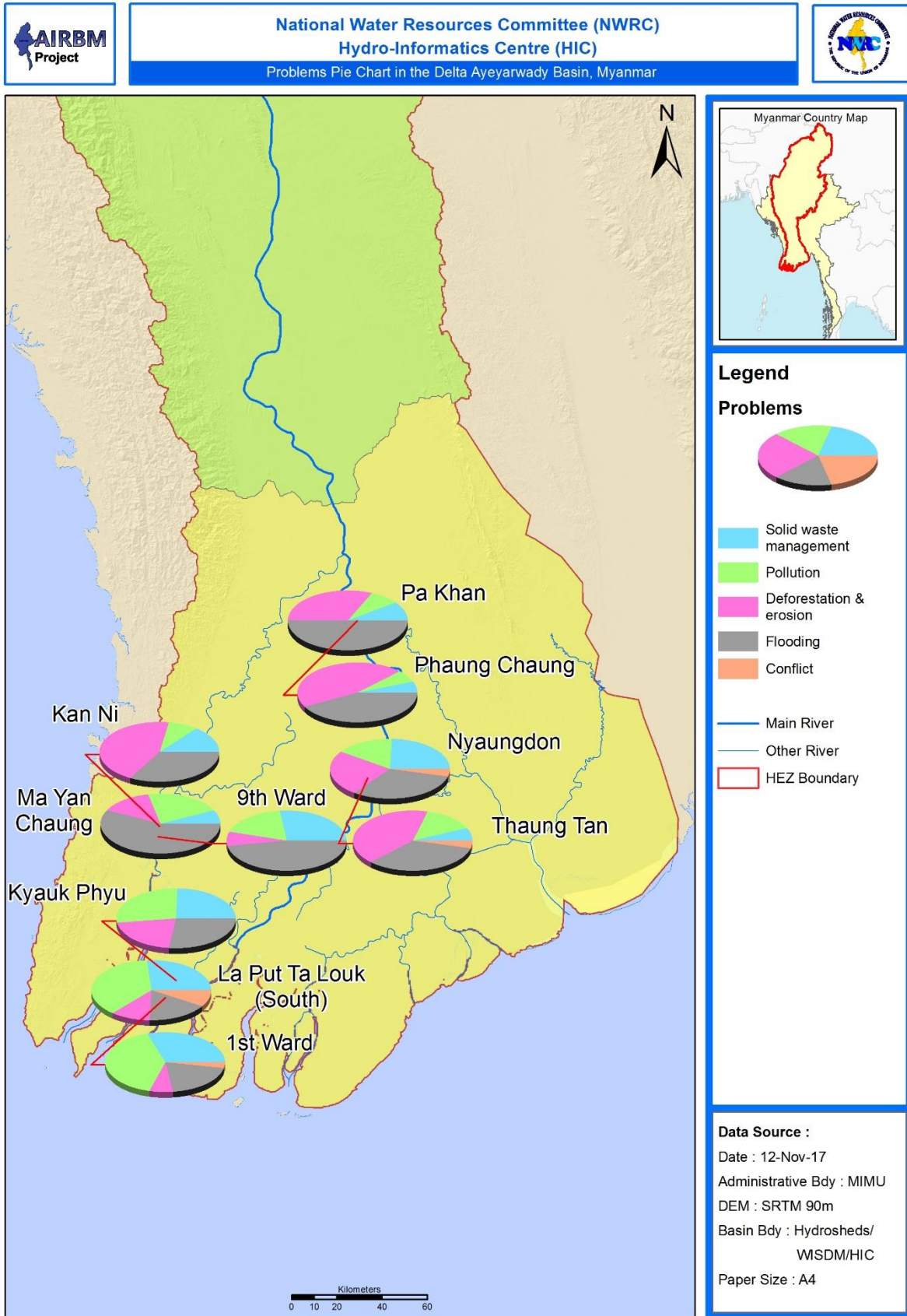


Figure 33 - Issues in Ayeyarwady Delta HEZ, as indicated by villagers in Nyaung don, Pathein, Labutta, and Hinthada townships



6.3 Values in Ayeyarwady Delta

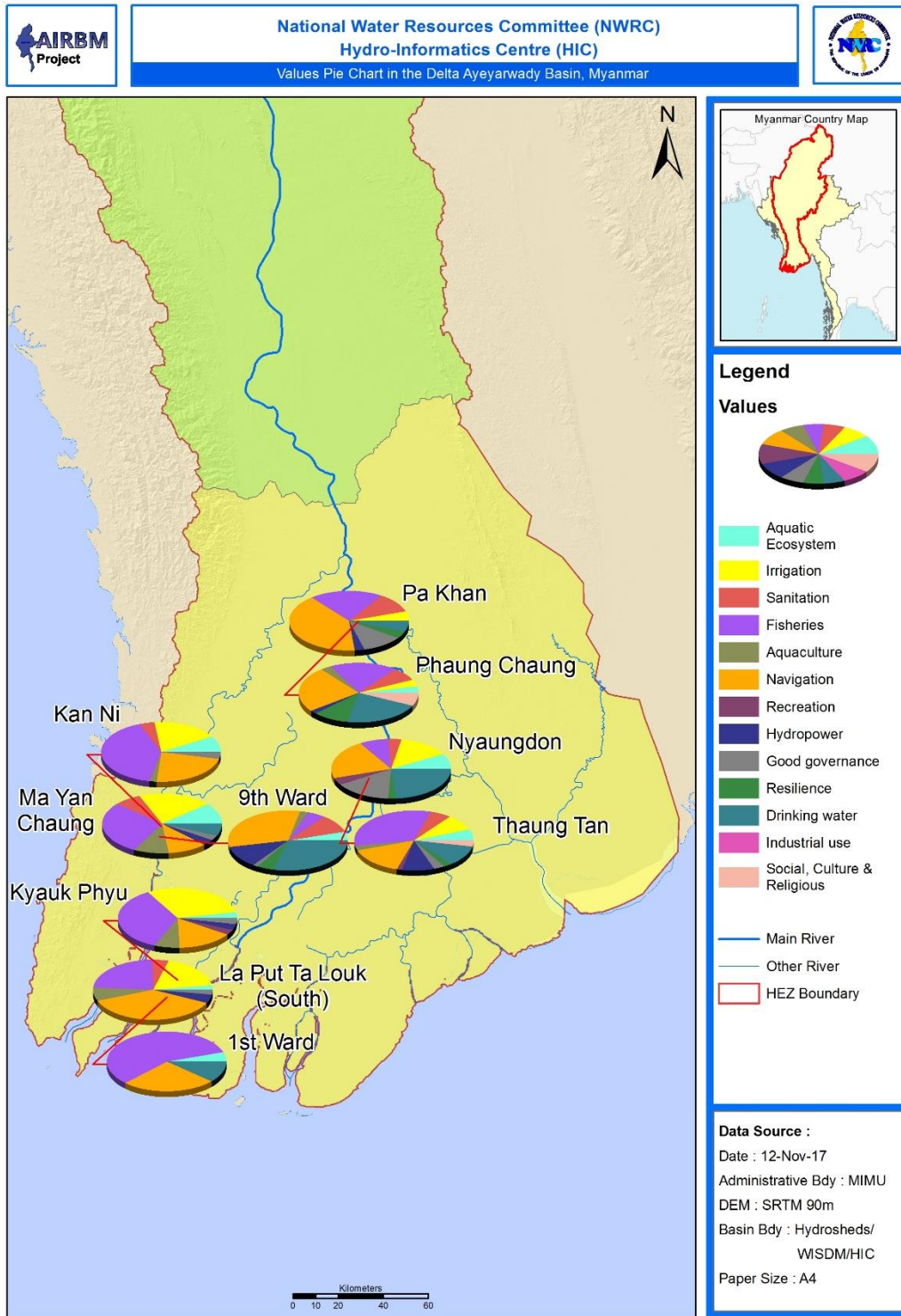


Figure 34 - Values in the Ayeyarwady Delta HEZ, as indicated by the villagers in Nyaung don, Pathein, Labutta, and Hinthada townships



#### 6.4 Intermezzo: Cultural/Religious Asset

##### ***A princess, a sacred well and a brand new “Mingalar San Eain” hotel***

Interesting observation in the Ayeyarwady Delta: a brand-new luxury hotel in the middle of nowhere, 6 kilometres outside of Labutta. Since we are looking for opportunity seekers and investment decisions as well, we interviewed the hotel manager to find out why the hotel was built in this location.

The hotel manager is one of nine siblings, originating from Dawei. When they were young, a fortune teller told their family that one of them would become rich. When his younger sister travelled the delta, she met a monk who showed her the well where a Mon princess took a bath in the ancient past. Because of this sacred place, a pagoda was built. The monk told that if his sister would protect and improve the pagoda, her fortune would be made. The family bought the land of the sacred well, and in place of the local guesthouse, they built this luxurious hotel. She also improved the pagoda, and the road leading to the pagoda.

We politely asked if the pilgrims could afford the hotel. Obviously not, so the hotel manager found a new target group in NGOs. Business is good and growing, so he aims to add a lecture hall, a bridge, a jetty for speedboats, and possible little bungalows as well. When people celebrate their wedding in the hotel, they get a suite for free.

The hotel manager expects developments to pick up further. The fishpond owners stay in his hotel as well, and he knows that it becomes very hard to buy land, because everyone is holding on to their property. There is hardly a tourism infrastructure, but if guests ask the General Administration Department or the city council where they can find a good hotel, this hotel is recommended.

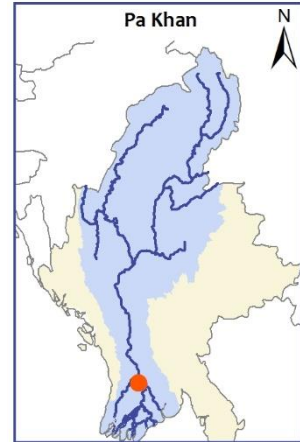


Figure 35 – Water taxi for motorcycles

## 6.5 Hinthada Township

### 6.5.1 Pa Khan

Main issues in Pa Khan village are **lack of fish** and **navigation**. The fisherwomen do not know the exact cause for declining fish, people believe that it is due to disturbing spawning areas and catching immature fish; navigation due to **bank erosion** is caused by **sand extraction**. The extractors dig for gravel, thereby disturbing the sand and causing sedimentation elsewhere. At the same time, the sand of the river banks erodes into the gravel pits. The people believe that this problem has worsened over time. Another issue is **flooding**. As in other villages, this problem has become worse in the last couple of years. Sometimes the villagers need to stay in the shelters for 3 months. Villagers often cannot earn much money because they used to have their own water management system: paddies with dikes. The dikes have been reinforced, while at the same time people live in the paddies. When the water outside the dikes rises, the officials opens the floodgates, causing water in the houses within the paddies. A solution on how to manage the floodgates and by whom should be considered. **Pollution and sanitation** are relatively minor issues. However, people dump solid waste straight into the river. The preferred solution would be to move the people slightly inland. The teachers present in the session are convinced that the curriculum should pay more attention to **river basin knowledge**. They do not include that into their lessons at the moment, but they teach children about hygiene, sanitation, and how to behave during a flood. The river has some special **spiritual meaning** for the community; the fishermen pray to the river spirit, in the hope that this will bring more fish.

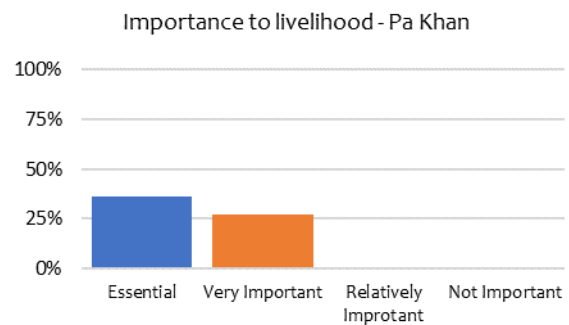
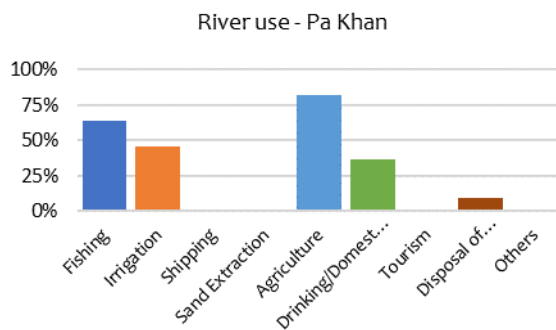


**Future dreams:** The villagers want children to receive a decent education so they can provide for their own livelihood. The parents hope that children will return to the village, but that will require local jobs.

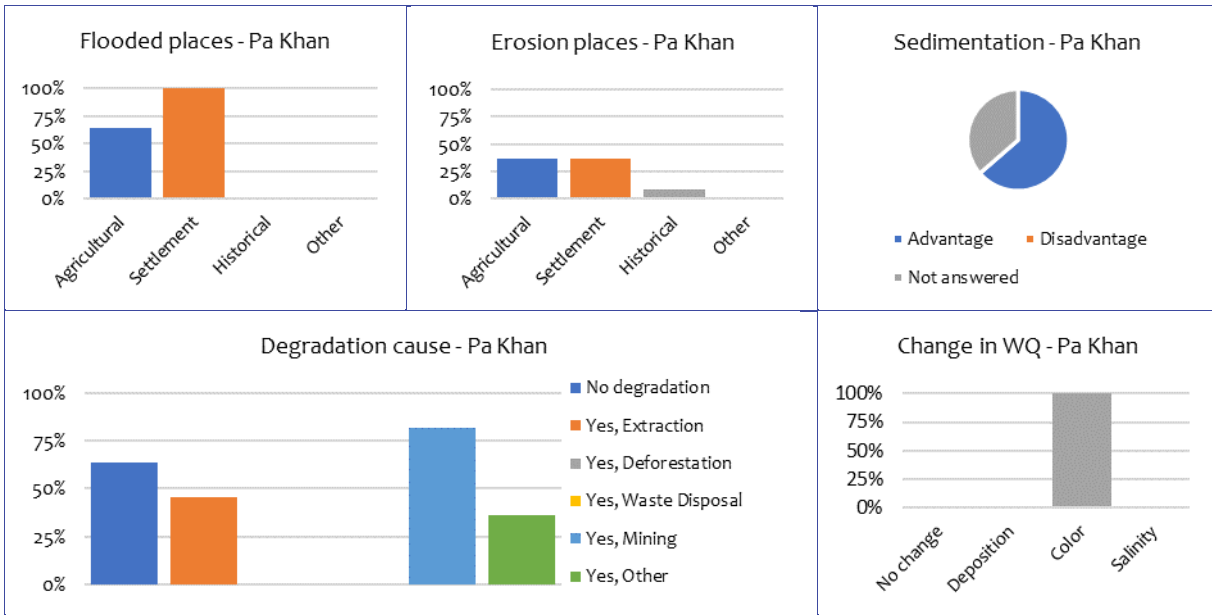
*“We have to stay at a temporary location for around 3 months when our house is flooded.”*

*“Wish our Ayeyarwady River has better navigation so that we can have more job opportunities.”*

*~ Housewife from Pa Kan village (4 July 2017)*



<b>DATE OF CONSULTATION</b>	4 July 2017
<b>NO. PARTICIPANTS</b>	40 (approximately 50% men and 50% women)
<b>OCCUPATION</b>	Fisherman, manual laborers, merchants
<b>BIGGEST VALUES</b>	Navigation, fishing
<b>BIGGEST PROBLEMS</b>	Lack of fish, navigation, flooding
<b>HOT TOPICS</b>	Mining



Pa Khan Village GAD office



Discussion with villagers



Explanation and discussion with 3D map



Villagers investigate problems, values & maps



Explanation and discussion with 3D map

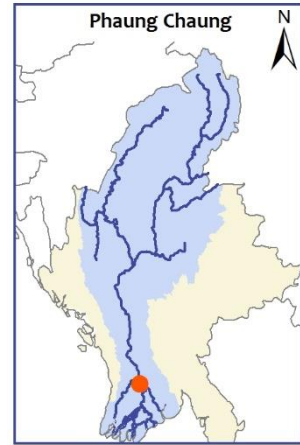


Villagers' important water values



6.5.2 Phaung Chaung

Paung Chaung Village has to be reached by boat during the rainy season. For the villagers, ‘fish’ is a very important source of income and the amount of fish is diminishing fast. Bigger ships from ‘outside’ the village use fishing gear that catch all fish, including the juveniles and they use batteries. Also, licenses are abused and **law enforcement** could be the solution for the fishing issue, according to the villagers. Another important issue is **flooding**, often caused by bank erosion. Also deforestation is a cause of **erosion** and changes in the river beds. Because sedimentation takes place on some locations, the river bed rised and more flooding occurs in the experience of the villagers. Another cause of erosion is **sand extraction** from the river by companies from the cities nearby, according to the villagers. **Clean drinking water** is an important value, and the quality is substandard due to solid waste dumping upstream of the river. Groundwater cannot be used because the level is very low. When they dig deeper the risk of arsenic occurs.



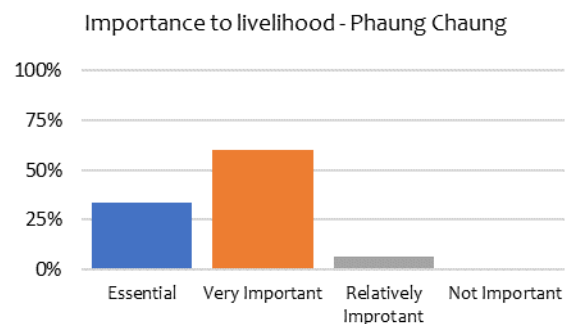
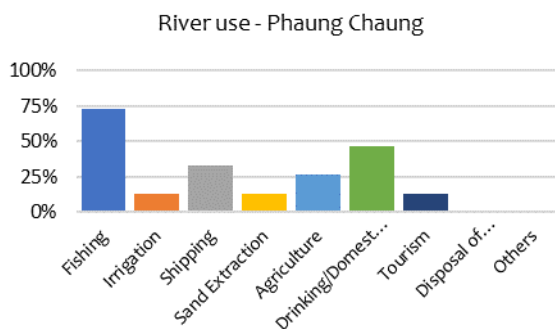
**Future dreams:** The villagers want affordable high school nearby and more local employment opportunities because the young people are moving away from the village.

*“Battery shock fishing is illegal. We need effective law enforcement to stop them.”*

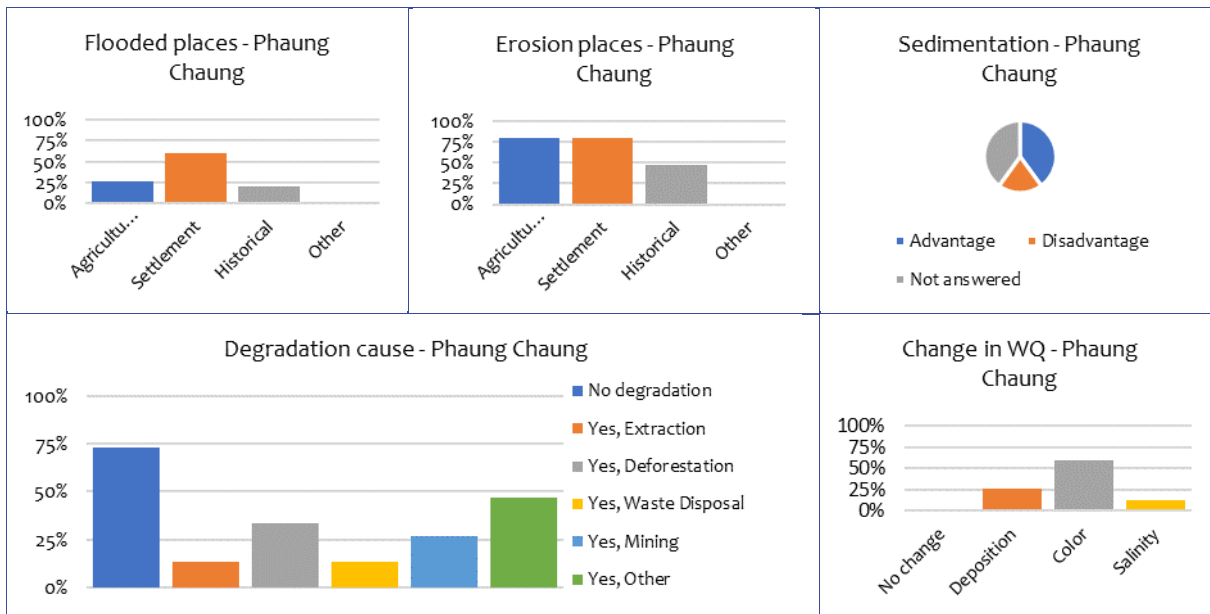
*“Sand and gravel extraction works really affect erosion. Years ago, our village was 200 yards far from river bank, but now we are only a few feet away.”*

*“Flooding makes our life very difficult. We have to move to somewhere, quit work, and sometime old people don’t survive the yearly floods.”*

~ Fisherman from Phaung Chaung (4 July 2017)



<b>DATE OF CONSULTATION</b>	4 July 2017
<b>NO. PARTICIPANTS</b>	97 (approximately 50% men and 50% women)
<b>OCCUPATION</b>	Fisherman, manual laborers, farmers
<b>BIGGEST VALUES</b>	Fishing, navigation, drinking water
<b>BIGGEST PROBLEMS</b>	Flooding, erosion
<b>HOT TOPICS</b>	Law enforcement



Visit to Phaung Chaung Village with boat



Field visit into Phaung Chaung village



Discussion with villagers



Villagers investigate problems, values & maps



Villagers who came to community session



Villager observing at river bank

## 6.6 Lubutta Township

### 6.6.1 Kyauk Phyu

In Kyauk Phyu Village, **irrigation** is the main topic of discussion, combined with **flooding** and **salt intrusion**. The farmers work in a rice paddy system, with slightly higher dikes surrounding the paddy fields. These dikes erode, thereby causing flooding of the fields. The villagers believe this erosion is caused by sea level rise, and **deforestation** in the coastal area. They believe that cutting of mangroves causes **sedimentation**, that enters the delta on high tide. Because fields nearer to the coast get flooded, their dikes collapse too. The houses of the villagers are not too much impacted by **flooding**; the villagers are quite used to this frequent phenomenon and adapted to live with the floods. **Sea level rise** causes salt intrusion deeper into the delta, according to the villagers. They see more salination, causing decreased crop yields. Another source of income is **fishing**. They state that the amount of fish caught is dropping, although they do not know why this is. There are also some big soft shell crab ponds, owned by foreign companies from Thailand and Singapore, who are bringing in their own employees, hence only 10% is local. **Solid waste management** and pollution are other important issues, often caused by the people themselves. One gentleman states that due to the growing amount of plastic in high water tides, trees he planted failed to grow. People are also concerned about **pesticides**, that are causing health issues.



**Future dreams:** The villagers hope for education for their younger generation and that they can move to the city. They do not need to come back, as long as they have a better life.

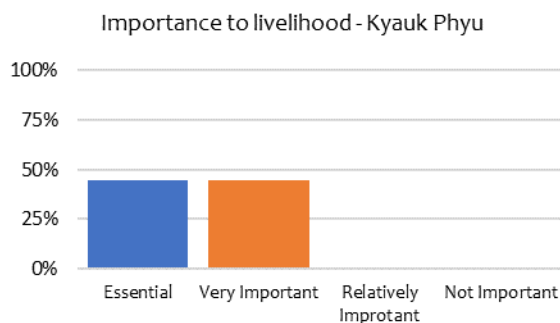
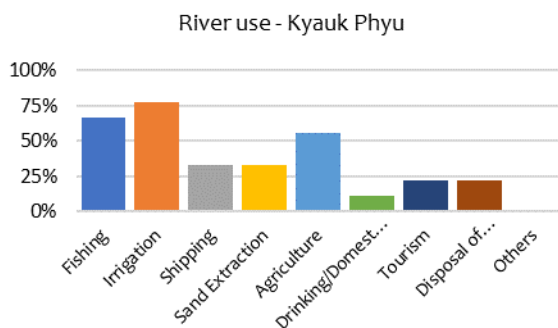
*“Our fishermen have to go to the sea for fishing.”*

*“We depend on rain water harvesting because river water is dirty.”*

*“Our economy in the village is worse and worse year by year.”*

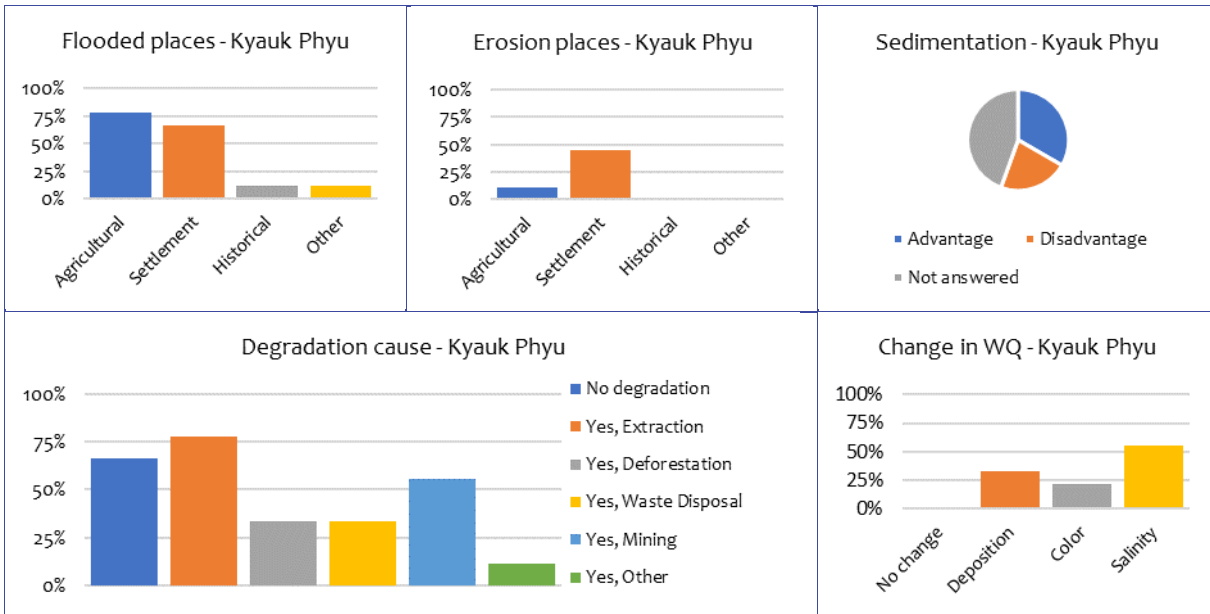
~ Village general administration officer from Kyauk Phyu

(2 July 2017)





<b>DATE OF CONSULTATION</b>	2 July 2017
<b>NO. PARTICIPANTS</b>	42 (approximately 70% men and 30% women)
<b>OCCUPATION</b>	Mainly farmers
<b>BIGGEST VALUES</b>	Irrigation, fishing, navigation
<b>BIGGEST PROBLEMS</b>	Flooding, erosion
<b>HOT TOPICS</b>	Irrigation, salt intrusion, solid waste management, pesticides



Discussion with villagers



Villagers who came to community session



Villagers investigate problems, values & maps



Feedbacks and reports from villagers



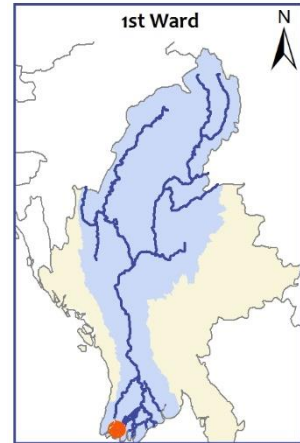
Lake in village used for drinking water



Field visit into Kyauk Phyu village

6.6.2 1<sup>st</sup> ward

At Ward (1), Labutta Township, the dominant theme was **fish**. The fishermen present were organized in a **fishing association**. The major complaint was about the **fishing license system**. They believe that since fishing is regulated (certain zones are delegated to certain committees as of 2012) they only catch half of what they used to catch. They want to be able to go wherever they please, and are certain that there is enough fish for everyone. They believe that they should be allowed to figure the fishing rights out between the associations. They are sure that this can be resolved without conflict: people who work hard, catch more, that is only fair. They believe that the allocation system has been designed for a wetland area, but that it does not fit here. In case they enforce the system themselves, they would organize monitoring among their associations. With the current system, they worry about the fact that during the months they are not allowed to fish, they need to repair their boats and buy their licenses. Both are expensive, so they need to borrow money. The money lenders ask up to 20% in rent, and happen to be the same people they sell their fish to. They suspect that they do not get the best prices for their fish. They conclude that, no matter how many fish they catch during the 5 months when they are allowed to, they are never able to pay off their **debts**. A potential solution to this problem would be better credits, with lower interest rates. The ladies of the group worry about **solid waste management**. The drainage canals get clogged by the solid waste people dump next to their houses. When high water comes, the waste just floats around with mosquitos and health problems as undesired consequences. **Drinking water** is of bad quality. Rich people buy bottled water, middle class people drink rainwater collected in clay pots, and poor people use the wells. **Flooding** is not a major issue, the only horrific experience the villagers had with flooding was during Nargis in 2008.

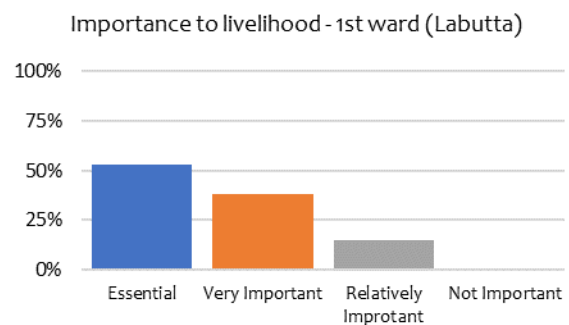
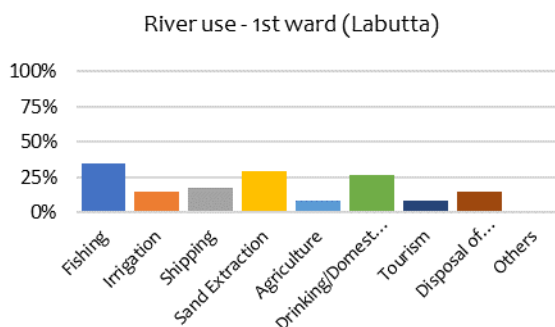


**“Our fishermen lost locations to fish because government forbid some area ownership for fishing.”**

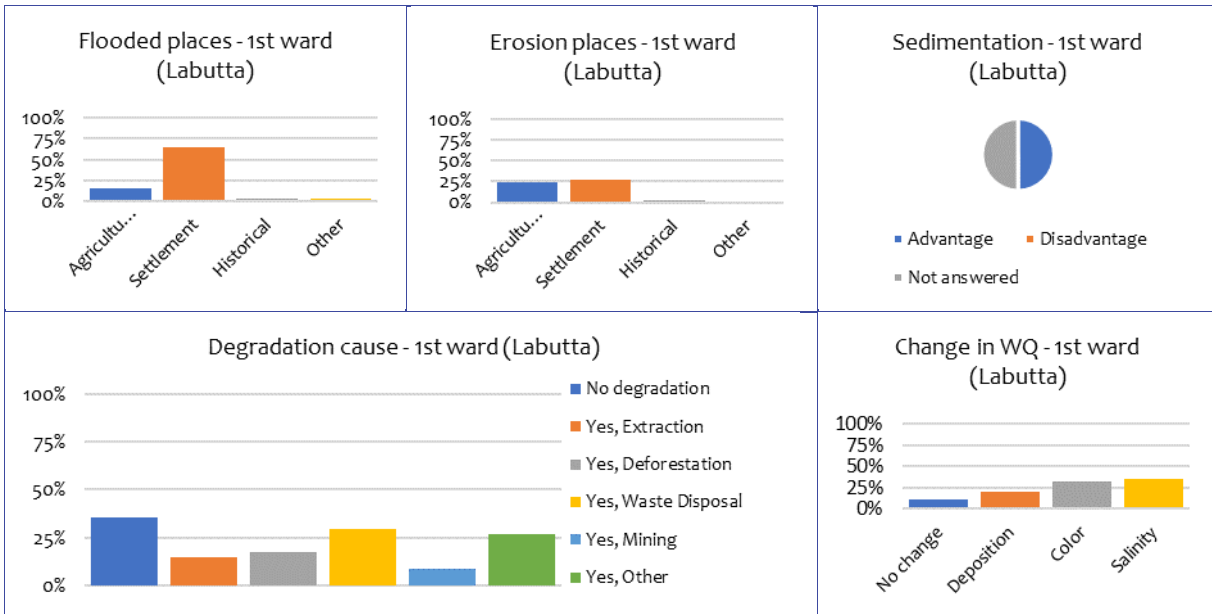
**“Fishpond store the egg laying fish in them and fish can’t get out to sea; caught in it and the ecosystem is disturbed.”**

**“Difference before and after Nagis cyclone is inflation.”**

~ Head of fishermen association (2 July 2017)



<b>DATE OF CONSULTATION</b>	2 July 2017
<b>NO. PARTICIPANTS</b>	32 (approximately 75% men and 25% women)
<b>OCCUPATION</b>	Mainly fishermen
<b>BIGGEST VALUES</b>	Fishing, navigation
<b>BIGGEST PROBLEMS</b>	Fishing issues, solid waste management
<b>HOT TOPICS</b>	Fishing licence system, drinking water



First Ward GAD office



Discussion with villagers



Explanation and discussion with 3D map



Villagers investigate problems, values & maps



Reporting issues on satellite map

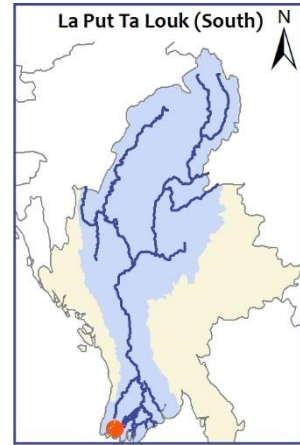


Villagers who came to community session



6.6.3 La Put Ta Louk (South)

La Put Tloke (South) villagers mentioned their concerns about **irrigation**, **erosion**, **sand banks** and **salt intrusion**. They explain that in the old days, the river(s) could go where they wanted, but now, because of the dikes of their own paddies and upstream, the river is forced to flow in certain ways. This causes erosion upstream, and sedimentation in their part of the system. Because of the sedimentation, sand banks occur, which makes **navigation** difficult, and **fishing** as well. In shallow waters live hardly any fish. They also believe that the overall fish population has decreased significantly the last couple of years, especially the saltwater fish. They believe the saltwater fish cannot find their way upstream anymore. And they suspect that the fish is being caught in their spawning areas and during spawning season. These perceptions, together with less license restrictions, are why fishermen nowadays fish closer to the sea, despite the threat of stronger tidal action. In the Paddy project from the eighties, the dikes protect against further salt intrusion, and the harvests have improved. **Irrigation** in itself is not problematic. The ladies complain about the **solid waste** problem. The amount of waste has increased significantly, and there is far more plastic amongst the waste than there used to be. She tries to teach people to burn the plastic, instead of throwing it into the river. Law enforcement for solid waste management is required according to the villagers. The waste causes health problems. Also **the lack of electricity** is a large issue.



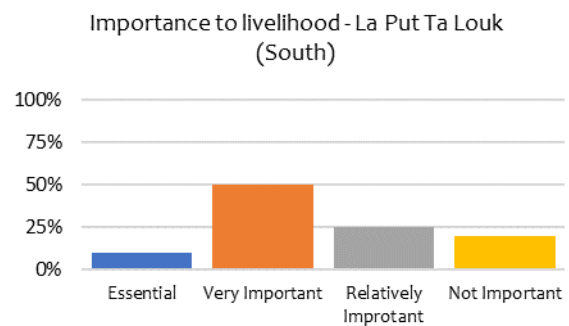
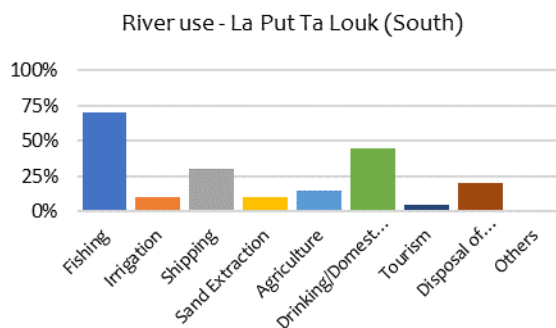
**Future dreams:** The villagers want better education. Up to 30% of the young people, mostly men, move to the city, like Yangon. They only return if they fail to find a job. They would like more local investments, to create local job opportunities.

**“Licensed big fishing groups take much more fishing area than they are allowed, and their groups are fishing at sea exit.”**

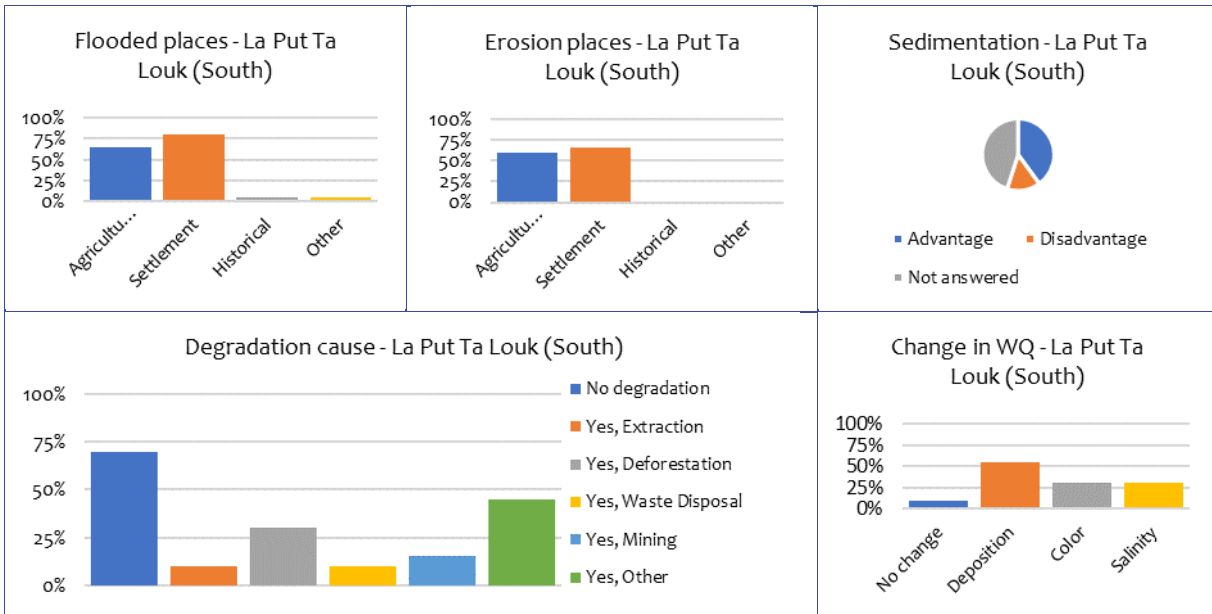
**“River depth is considerably reduced compared to last 10 years.”**

**“We young people need electricity most. We can use it for small mechanic workshop and other alternate income.”**

~ Fiserman from La Put Ta Louk (South) (3 July 2017)



<b>DATE OF CONSULTATION</b>	3 July 2017
<b>NO. PARTICIPANTS</b>	30 (approximately 60% men and 30% women)
<b>OCCUPATION</b>	Manual laborers, farmers, fishermen
<b>BIGGEST VALUES</b>	Navigation, fishing, irrigation
<b>BIGGEST PROBLEMS</b>	Solid waste management, pollution
<b>HOT TOPICS</b>	Poverty, lack of electricity, fishing difficulties



La Put Tloke (South) Village GAD office



Discussion with villagers



Villagers investigate problems, values & maps



Reporting issues on satellite map



Feedbacks and reports from villagers



Middle school in the village

## 6.7 Nyaungdon Township

### 6.7.1 Nyaungdon

Nyaungdon is dealing with **drinking water** problems. The villagers use their water for domestic use from the river, and some villagers also use this water for drinking. In the dry season, the quality is all right, but in the rainy season the water becomes very muddy due to sedimentation. **Solid waste management** is also a problem. People dump their waste in the river. The local council tries to set up a program to collect waste, but it is not enough. The villagers explain that the **erosion** has gotten a lot worse where they live, because of new dikes. Possible **deforestation, gold mining, sand mining, and mangrove destruction** in the lower delta influence **erosion** and **sedimentation** patterns. The villagers explain how they think this influences their increased **flooding** experience. Every village we meet in this area tells us that the flooding has become worse during the last couple of years (ranging from 2012 – 2016). A possible trade off near the Mezali sluices: farmers understand that the water is managed in such a way to ensure that enough fresh water reaches Yangon, but they want the regime of the sluices to be changed, so that they have fresh water as well and the water level is not affected too much. The community asks the government to **raise awareness of how the system works**, in order to lower the risk of flooding. They want people upstream to be more responsible. When we ask the local village leaders how they think the **responsibilities** should be divided, they answer: we will take care of the maintenance of the system, the regional and national government should take care of the budgets, law enforcement and awareness raising.



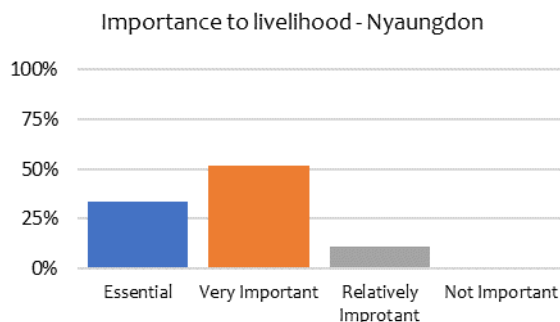
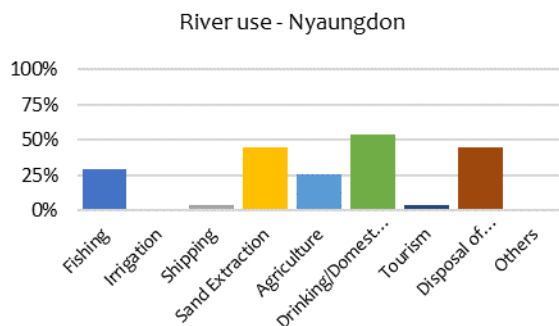
**Future dreams:** The villagers believe that if the water system will be managed in a better way, they and their children will live here over twenty years. For it is a very good place to live.

**“I believe river bank erosion and river shape changes are much related to environmental changes.”**

**“Deforestation and gold mining upstream are really affecting the flooding and river water quality.”**

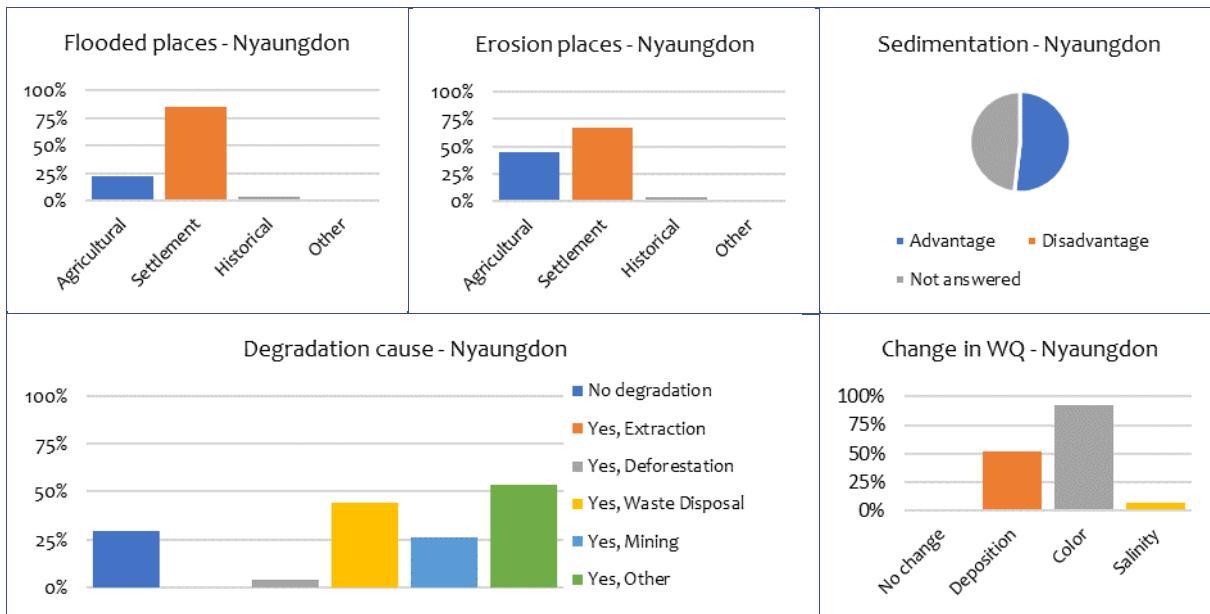
**“I want people in Ayeyarwady region to protect our Ayeyarwady River as best as we can for a better river ecosystem.”**

~ Bean merchant from Nyaungdon (29 June 2017)





<b>DATE OF CONSULTATION</b>	29 June 2017
<b>NO. PARTICIPANTS</b>	29 (100% men)
<b>OCCUPATION</b>	Traders, farmers
<b>BIGGEST VALUES</b>	Drinking water, good governance, navigation, irrigation
<b>BIGGEST PROBLEMS</b>	Erosion, flooding, riverflow changes
<b>HOT TOPICS</b>	Drinking water problems, solid waste management



Group photo session



Discussion with villagers



Villagers investigate problems, values & maps



Explanation and discussion with 3D map



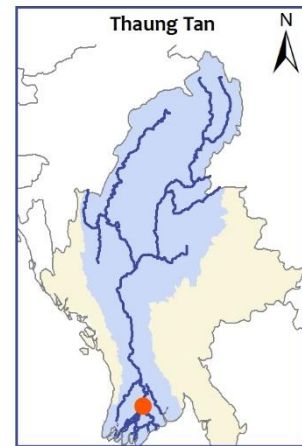
Reporting issues on satellite map



Feedbacks and reports from villagers

6.7.2 *Thaung Tan*

In Thaung Tan Village, the villagers face **flooding** for two months each year. The soil is good for **farming**. They need to live close to their fields and when the floods come, they move to higher grounds, like the local monastery. While they are living in the monastery, they cannot work. Money and **poverty** seems to be the real issue here. The people need to borrow money to buy seeds for farming. They would like to get better credit so that they can earn their living with farming, improve their homes, and send their children to school. They have little faith in a better future: they believe that without help, their villages will be washed away in approximately 20 years. Some family members try to migrate to the cities, but life in Yangon, for example, is too expensive, so they return to the village. The people believe that **flooding** has become worse over the years. They can show where they believe the problems originate from: **sand mining** and **deforestation** upstream. The villagers also believe that the bridges that have been built cause sedimentation. Because of sedimentation, the riverbed rises, thereby causing erosion of the banks and flooding.



**Future dreams:** The villagers hope to send their kids to school. A couple of primary school teachers addressed the importance of good education, but also the costs that are sometimes difficult to cover.

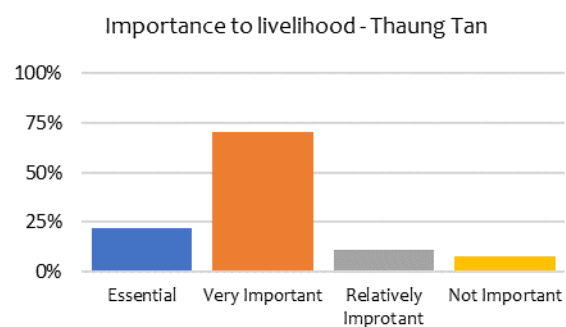
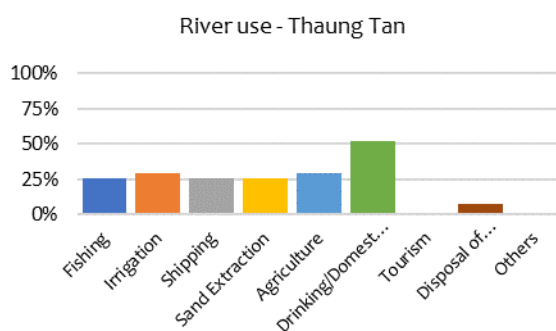
*“Our school has to close when floods occur.”*

*“Children have to go to Nyaungdon for high school and most people cannot afford it.”*

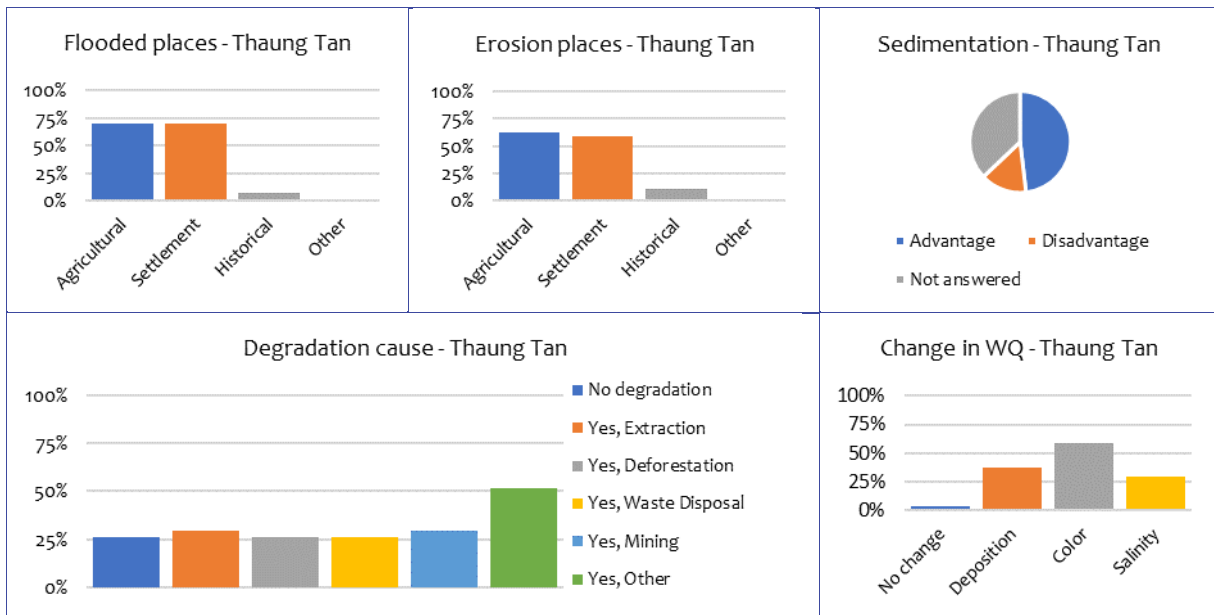
*“We want a high school in our village or around the area.”*

*~ Middle school teacher from Thaung Tan*

*(29 June 2017)*



<b>DATE OF CONSULTATION</b>	29 June 2017
<b>NO. PARTICIPANTS</b>	85 (approximately 55% men and 45% women)
<b>OCCUPATION</b>	Fishermen, farmers
<b>BIGGEST VALUES</b>	Fishing, navigation, hydration
<b>BIGGEST PROBLEMS</b>	Flooding, erosion
<b>HOT TOPICS</b>	Poverty, sand mining, deforestation (upstream)



Travel to Thaug Tan Village



Building for community session



Discussion with villagers



Discussion with villagers



Villagers investigate problems, values & maps



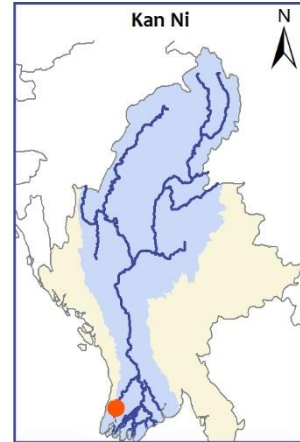
Feedbacks and reports from villagers



## 6.8 Pathein Township

### 6.8.1 Kan Ni

Kan Ni Village is located next to the Pathein bridge. Most people present were fishermen and **fishing** was a large issue, in particular the licensing system and the lack of law enforcement thereof. The fishermen at Kan Ni side of the river accused the fishermen from the other side of the river of fishing with too heavy material, and/or illegal means like batteries and poison, which would cause a decline in the total amount of fish. Since other fisherman also fish outside the designated season and area, they also believe spawning of young fish is endangered. The officials of the regional Fishery Department try to enforce the rules, but lack resources to effectively do so. The danger of increased **flooding** is another issue. The villagers can pinpoint precisely where, in their opinion, **erosion** originates, often caused by **sand mining** in the neighborhood. The sand is being mined for the development of infrastructure and hotels at the coastal area in the West of Myanmar. Near to the village, a lot of sand mining is taking place in the river and a distribution centre is located next to the river on the west-side. Trucks with gravel from the beach (Ngwe Saung) are too heavy to cross the bridge to Pathein city, so distribution takes place via the river. Because of the sand mining, the course of the river is changing. The mining is being regulated by permits, but people suspect that development of the coastline is more important than local erosion and flooding. Another element that redirects the course of the river are the two **bridges**. The pillars of the bridges cause sedimentation, thereby changing the course. The villagers state that it is unnecessary to have two bridges in such close proximity and that “outside interests” might be the reason for two bridges. **Agriculture** is important and one crop a year is the largest issue. The Irrigation Department provides drainage but cannot irrigate the entire area. The people would like to improve their livelihoods by getting access to cheaper and better **fertilizers**. Now they can only choose between two brands from outside Myanmar. They hope for more international investors in fertilizers, so that they can improve their crops, have more choice in fertilizers and make more money.

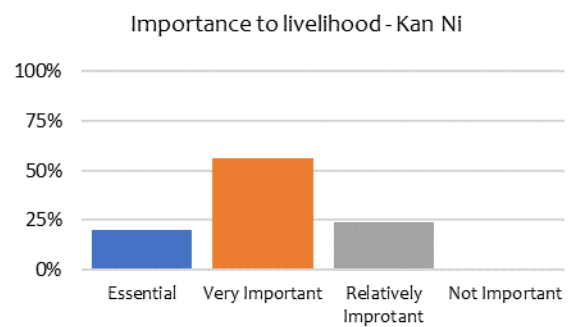
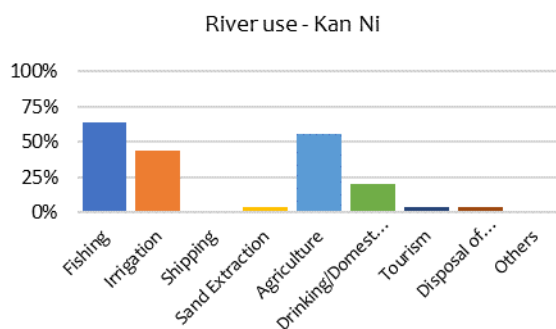


*“Other fishermen use tiger net fishing, catch small fish during the restricted season.”*

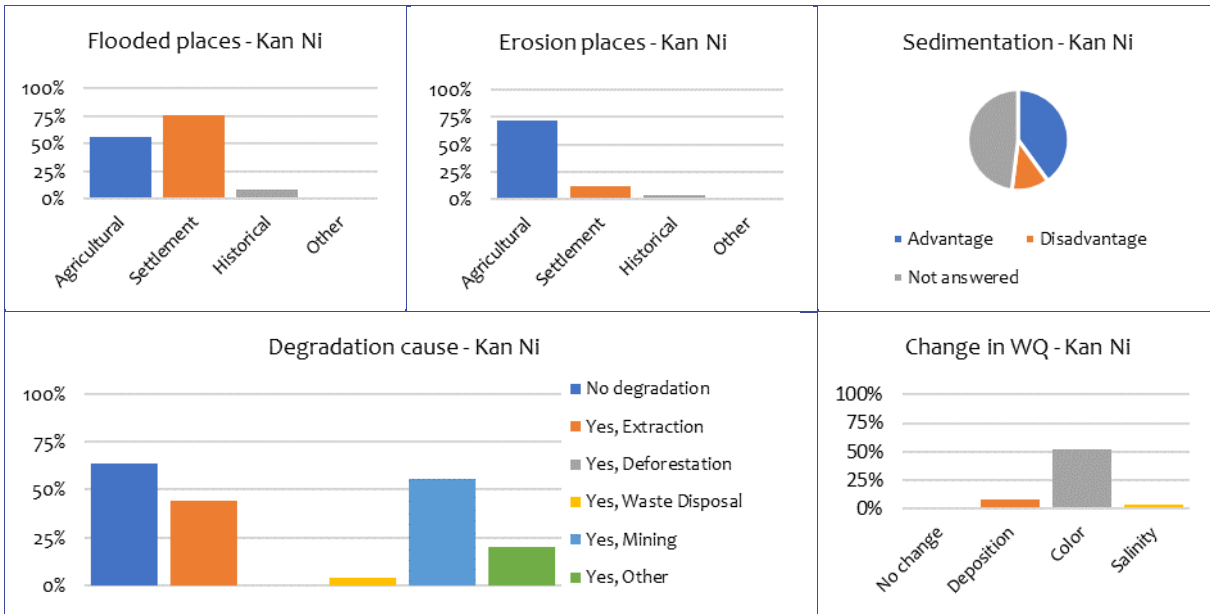
*“Illegal fishing activities like battery shock and use of chemical are found.”*

*“We are having trouble to work because the number of fish is reducing because of the illegal actions of other fishermen.”*

~ Fisherman from Kan Ni (30 June 2017)



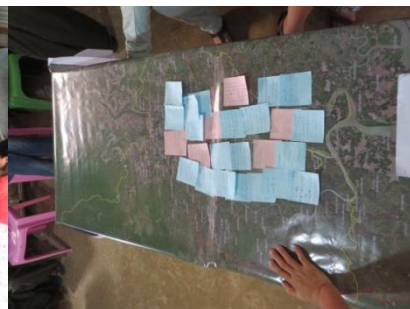
<b>DATE OF CONSULTATION</b>	30 June 2017
<b>NO. PARTICIPANTS</b>	30 (approximately 60% men and 40% women)
<b>OCCUPATION</b>	Fishermen, manual laborers, farmers
<b>BIGGEST VALUES</b>	Fishing, navigation, irrigation
<b>BIGGEST PROBLEMS</b>	Erosion, riverflow changes, flooding
<b>HOT TOPICS</b>	Fishing licensing system, law enforcement, sand mining



Kan Ni Village GAD office



Discussion with villagers



Reporting issues on satellite map



Villagers investigate problems, values & maps



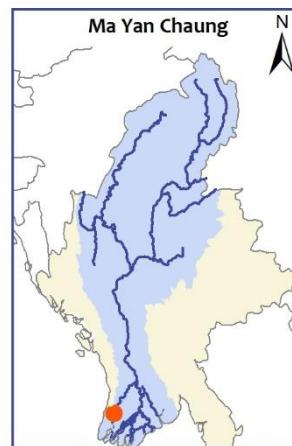
Feedbacks and reports from villagers



Observing sand and gravel extraction at river bank

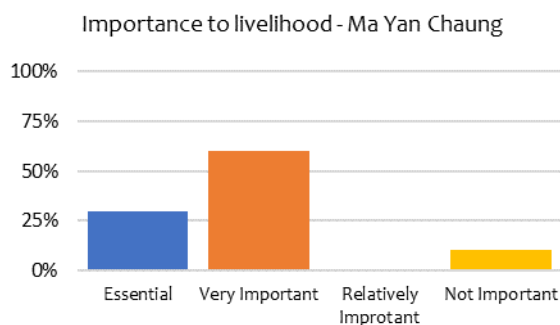
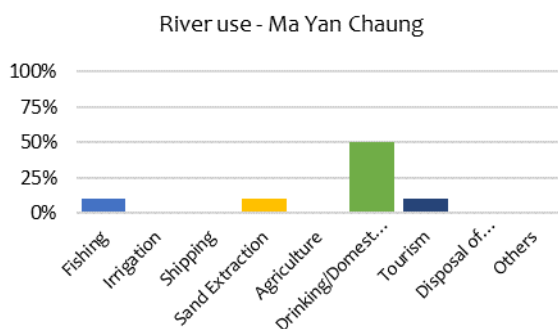
6.8.2 Ma Yan Chaung

At Ma Yan Chaung village the main source of income is **fishing**. They have experienced a significant decrease in amount of fish they catch the last couple of years. This is caused by the fact that there are less fish, more fishermen, and poor law enforcement. Especially saltwater fish has decreased, fresh water fish is stable. The fishermen suspect that this decrease in saltwater fish is caused by barriers to fish intrusion. These barriers are made up of **sandbanks, due to sedimentation and blockages** caused by all the natural debris that floats down the river during the rainy season. Furthermore, other fishermen are using batteries and chemicals. Solutions mentioned by the community could consist of **improved law enforcement** by the Department of Fisheries, **channelization of certain river sections** and by **removal of blockages in the river system**. Another value that scores high marks in this group is **aquaculture**. A lot of fishponds are being developed by outside investors and private companies. These companies do not use local labor. The villagers are convinced that the small dikes around the fishponds are clumsily designed and erode quickly, thereby clogging their **drainage system**, which causes a decrease of **irrigation capacity** in the dry season and contributes to **floods** in the rainy season. The villagers had a dialogue with the owners of the fishponds, have raised these issues, and some measures have been taken. Their main issue is **flooding**. This has become significantly worse since dikes were put along parts of the river, according to the villagers. In 2016 the villagers experienced the worst flooding so far. They were all born in this area, and never experienced flooding like that before. For safety, they must spend 1.5 month in the monastery. In this period, they cannot work, only fish a little for their families to survive. If they stay in their houses, they would have become ill. What concerns the women most of all is that during this period their children cannot go to school. Therefore, the children will get behind compared to their fellow students and reduce their chances for a good **education** and a better life. According to the villagers, improvement of the drainage system by the government is the most important solution to deal with the floods.



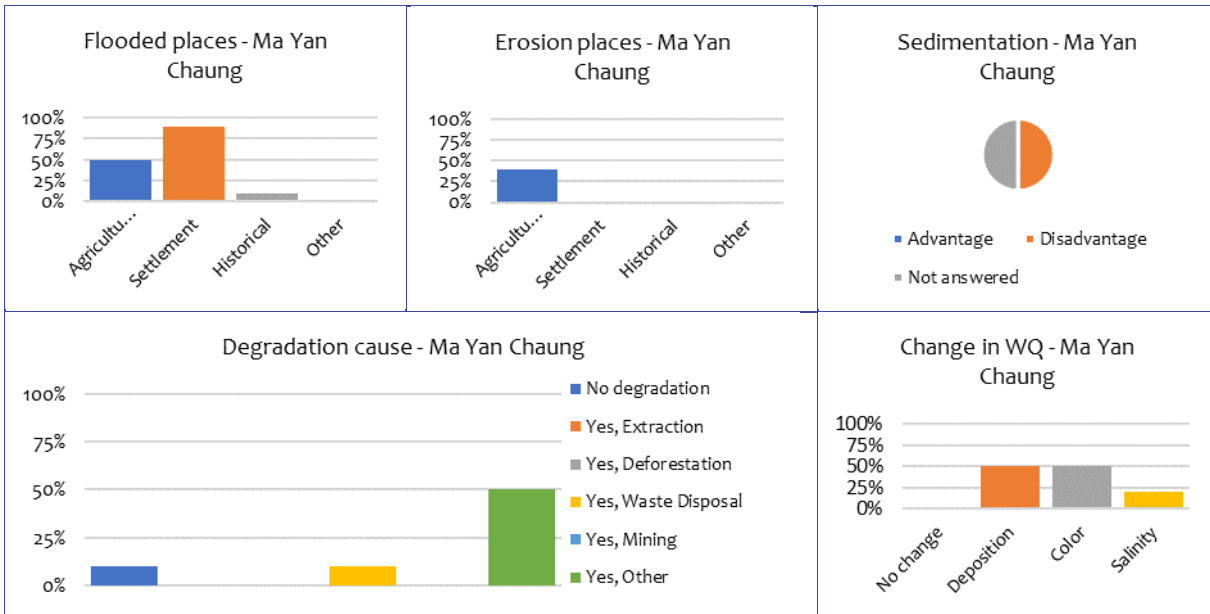
**“We have more intensive flooding after the construction of the Pathein Bridge. Road embankments are the main reason of floods. Because of these, we can’t grow rice during rainy season and we have no water during the dry season.”**

~ Farmer from Ma Yan Chaung (1 July 2017)





<b>DATE OF CONSULTATION</b>	1 July 2017
<b>NO. PARTICIPANTS</b>	32 (approximately 60% men and 40% women)
<b>OCCUPATION</b>	Fishermen, farmers, merchants
<b>BIGGEST VALUES</b>	Irrigation, fishing, aquaculture, navigation
<b>BIGGEST PROBLEMS</b>	Flooding, erosion
<b>HOT TOPICS</b>	Decreased amount of fish, education



Discussion with villagers



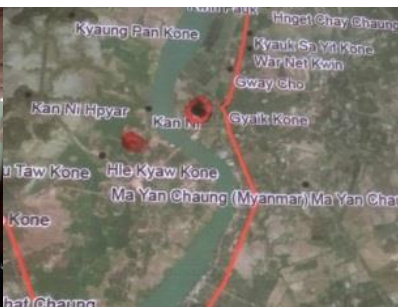
Reporting issues on satellite map



Feedbacks and reports from villagers



Villagers investigate problems, values & maps



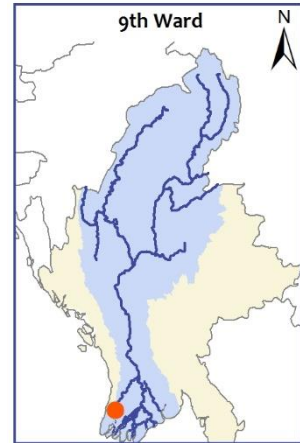
Location of village on satellite map



Pagoda in village's monastery

6.8.3 9<sup>th</sup> ward

The villagers in Pathein Ward (9) are using **river transport** on a daily basis. There is no bridge where they live, so **navigation** is an important water value for the people. They are too poor to own their own boat, so they need to rent. The ferry is very cheap and affordable for most. Since Pathein is growing so fast, they expect, and hope, that a **bridge** will be build soon. Their main problem is **flooding**, lasting for 3 months and becoming worse since 2004. When they were young, floods occurred every three years, and would last for a couple of days. Now they have floods every year, and the floods last for months with much higher water levels than before. According to the villagers, the disappearance of forests near Pathein could be a cause of erosion resulting in more turbidity in the river. During the floods, people need to go to the **shelters**, like a high school or a monastery. These shelters are more and more filled to their capacity, sometimes to the point of overcrowding. When the people stay in shelters, they cannot work. When they have earned enough during the dry season, they can bring their own food to the monastery, otherwise they have to stand in line and wait for relief goods to be handed out. When they have enough money, they can build a house on poles (i.e., a long-legged house), so that they are less bothered by the flood. The floods can be very high, sometimes more than 5 feet and ruining the floors of their housing. Because the floods make them stop working during the rainy season, they need to save enough money before the rainy season starts. Another important issue mentioned is **solid waste management**. A lady of the Women and Children’s department has stimulated a government program to collect solid waste, but unfortunately the bins are not big enough, and the collection of waste is not frequent enough. A lot of waste is dumped in the river. This causes **water pollution**, which is a problem because people use water for domestic use. However, so far it is not causing health problems. She tries to raise local awareness of the issue in order to prevent people from dumping waste in the river. For **drinking water and domestic water use** the villagers use groundwater wells. To the untrained eye the water looks quite undrinkable, but the villagers assure us that it is good for drinking, especially when mixed with rainwater. They also use the special Myanmar crystal (like in other place in Myanmar) to clean the water.

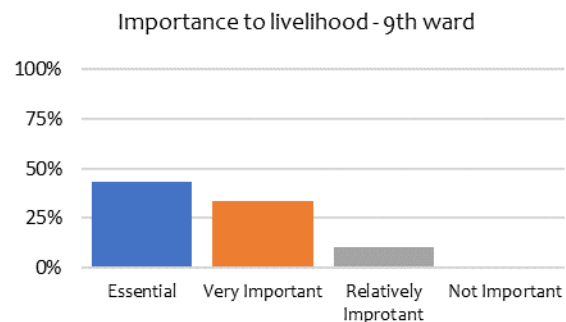
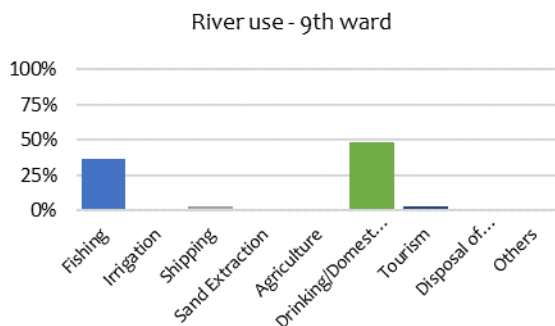


*“We face floods when the river is high, intensive rainfall and high tide.”*

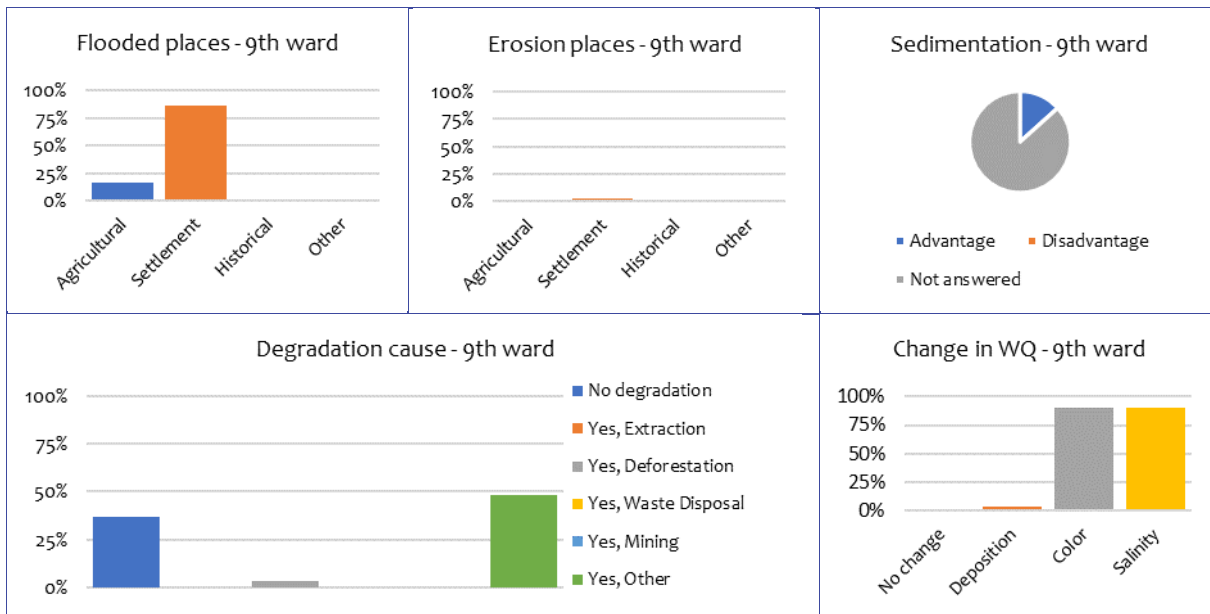
*“Flooding is very severe compared to the time we were young.”*

*“Decrease in river depth is also a reason for bad navigation and flooding.”*

~ GAD officer from 9<sup>th</sup> ward (30 June 2017)



<b>DATE OF CONSULTATION</b>	30 June 2017
<b>NO. PARTICIPANTS</b>	30 (approximately 60% men and 40% women)
<b>OCCUPATION</b>	n.a.
<b>BIGGEST VALUES</b>	Navigation, drinking water
<b>BIGGEST PROBLEMS</b>	Flooding, solid waste management
<b>HOT TOPICS</b>	Water pollution, sheltering



Visit to Ward (9) with boat



Discussion with villagers



Reporting issues on satellite map



Villagers investigate problems, values & maps



Field visit along the river bank



Observing drinking well from village