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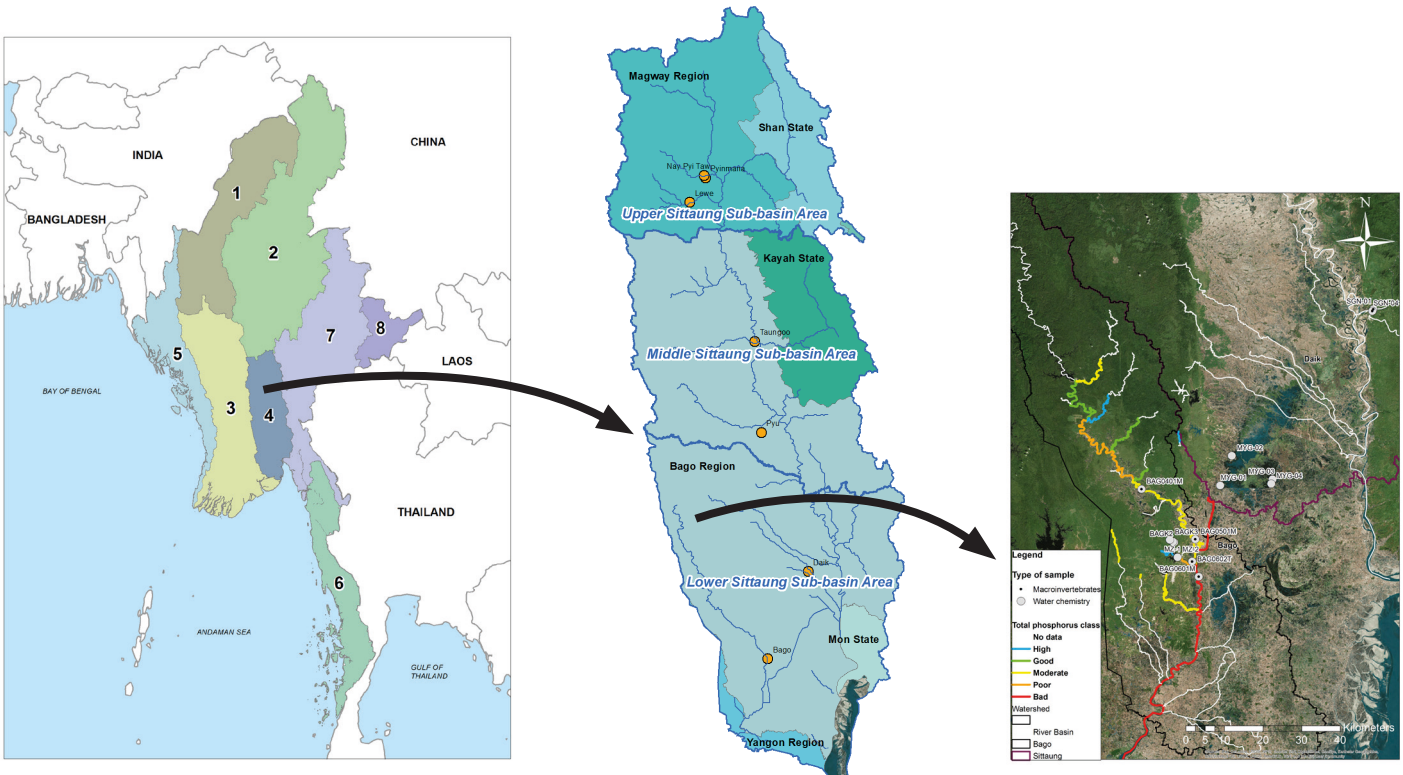
Piloting river basin management in the Bago Sub-basin, experiences and recommendations



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Summary

The aim of the IWRM project has been to pilot the development of a coordinated River Basin Management Plan. The report presents the procedures applied and the experiences gained as part of this pilot in the Bago River Sub-basin during the period 2015 - 2018. The report explains the basic principles for River Basin Management Approach and provides a brief overview of the history of water management in Myanmar including public participation. The report describes and reflects on, the efforts undertaken in the project to delineate the administrative Sittaung River Basin Area with Sub-basin Areas. The processes and the experiences of establishing platforms for coordination and non-governmental stakeholder participation for IWRM are presented. The theories and perspectives of environmental management and decision making which have guided main practical management steps as undertaken in the project for the development of the Bago Sub-basin Management Plan are described and reflected on.

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Piloting the river basin management in the Bago Sub-basin Area, experiences and recommendations

Preface

Development of River Basin Management Plans (RBMPs) is an important strategy for improving environmental status of water resources, a strategy recognized by a number of international IWRM frameworks, such as the EU Water Framework Directive (WFD), the UNESCO guidelines, and NARBO (Network of Asian River Basin Organizations). Development of RBMPs include several distinct steps of knowledge production and collation, identification of environmental objectives and deciding on a program of measures, coordinated decision making, stakeholder involvement.

The 'Integrated Water Resources Management – Institutional building and training' (the IWRM project) is a collaboration project between the Norwegian Institute for Water Research (NIVA) and the Forest Department (FD) Ministry of Natural Resources and Environmental Conservation (MONREC). The Irrigation and Water Utilization Management Department (IWUMD) Ministry of Agriculture, Livestock and Irrigation is an associated partner to the project. The project is part of the Norwegian – Myanmar Bilateral Environment Programme, 2015-2018 and it is funded by the Norwegian Embassy in Myanmar. The goal of the IWRM project is to make a significant and positive contribution to the implementation and functioning of Integrated Water Resources Management in Myanmar for inland waters at the national level. The objective is to establish methods and standards for Integrated Water Resources Management and to support initiation of the implementation process.

The IWRM project has selected the Bago River Sub-basin in Myanmar for pilot testing of the River Basin Management Approach with a Sub-basin Management Plan as output.

This report describes the procedures of implementing the pilot IWRM project and the experiences gained during the three-year process. The report presents a description of all steps of implementing the river basin management approach; from delineation of river basins, to development of an administrative set up for coordination and involvement, and then the practical water management tasks undertaken.

The report has been prepared by Ingrid Nesheim, NIVA, Zaw Win Myint and Toe Aung WMD FD, Marianne Karlsen NIVA, Zaw Lwin Tun and Hla Oo Nwe (IWUMD), Nikolai Friberg, NIVA

We would also like to acknowledge the contribution by, Ko Oo, Irrigation and Water Utilization Management Department Bago Region; Htay Aung, Directorate of Water Resources and Improvement of River Systems Bago Region; the three secretaries of the Non-Governmental Stakeholder Group, Dr. Hein Thant Zaw, Mg Kyi and Aung Myo Htut, Kyaw Min San the former Bago Committee chair, and the current Committee chair and Bago MONFREC minister, Dr. Saw Nyo Win, Bo Ni, Phyo Thet Naing, Swuam Pyaye Aye Aung, Tor Erik Eriksen, Phyo Wai.

We hope the report will contribute with useful perspectives on river basin management so that the experiences gained as part of this pilot in Bago can be useful for others striving to implement IWRM and river basin management in Myanmar.

Oslo, 19. November 2018

Ingrid Nesheim *Zaw Win Myint*

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Summary

The report presents the procedures applied and the experiences gained when piloting the river basin management approach in the Bago River Sub-basin during the period 2015 - 2018. The aim has been to pilot a coordinated River Basin Management Plan to gain experience for future deployment in other Myanmar river basins. This work has been conducted within the framework of the 'Integrated Water Resources Management – Institutional building and training' (the IWRM project)', a collaboration between the Watershed Management Division Forest Department (WMD FD), the Irrigation and Water Utilization Management Department (IWUMD) and the Norwegian Institute for Water Research (NIVA).

Chapter 1 Introduces the purpose and the objectives of this pilot implementing the river basin management approach in Bago, and frames the approach within the relevant Myanmar policies. The chapter furthermore emphasises the feedback and the dialogue with the National Water Resources Committee Advisory Group, for the development of this RBMP pilot.

Chapter 2 explains the basic principles for River Basin Management Approach. This includes that basin boundaries are set as management boundaries, a clear aim of the Myanmar National Water Framework Directive and also of other international IWRM frameworks. According to the approach, water is coordinated in an integrated way within the river basin, including surface waters, ground waters, and the marine influence area across administrative borders like states, regions, towns, and municipalities. As background for this RBM pilot, the chapter provides a brief overview on the history of water management in Myanmar including public participation. Furthermore, the pilot strategy of implementing the RBM refers to the principles of the EU Water Framework Directive, but give emphasis to an adaptive management approach, and a step-wise approach enabling a contextualised and a learning by doing process

Chapter 3 reports and reflects on the efforts undertaken in the project to delineate administrative river basins. The chapter presents the delineation procedure organized for the Sittaung River Basin Area, including Sub-basin Areas, and the attempt to identify possible Sub-basin Areas in Myanmar, excluding coastal areas.

In *Chapter 4* we discuss challenges, opportunities and mechanisms which may be desirable for coordination and participation within the frames of river basin management, and we present the processes and the experiences of establishing platforms for coordination and public or non-governmental participation for IWRM in Bago.

Chapter 5 presents theories and perspectives of environmental management and decision making which have guided our approach in Bago. The main practical management steps as undertaken in the project for the development of the Bago Sub-basin Management Plan, and some reflections and recommendations are provided. *Chapter 6* provides final remarks on the pilot and sums up achievements, and challenges, and the way forward for a continuation towards IWRM in Myanmar.

1 Introduction

The river basin management approach has been implemented as a pilot in the Bago River Sub-basin Area during the period of the 2015-2018. The pilot used the Myanmar National Water Framework Directive (MNWFD) as the national reference; as international reference, the pilot referred to the EU Water Framework Directive while considering also the UNESCO IWRM guidelines. The Bago pilot reflect the EU WFD in that it sought to follow the systematic water management referred to in the Common Implementation Strategy (European Commission 2000). Yet, core characteristics of the pilot has been to establish an adaptive and flexible approach adapted to the Bago local context, and to the institutional arrangements of water management in Myanmar within the frames of an IWRM and river basin management approach. This report presents the experiences of this pilot implementing the river basin management approach in Bago.

The Myanmar National Water Framework Directive (MNWFD) is a policy framework, which aims to implement the river basin management approach in Myanmar (adopted by the National Water Resources Committee, October 2014). The policy framework specifies seven directives including ecological and chemical status of water, river basin management and participation. The National Water Policy (NWP) is another important reference for this pilot. The NWP states the aim to manage the water resources of Myanmar in an integrated, holistic and socially inclusive manner, to contribute significantly to the poverty alleviation, to the green growth and sustainable development of the nation, by providing access to water of equitable quantity and safe quality for all social, environmental and economic needs of the present and future generations. In addition, we highlight the importance of the feedback and the dialogue with the National Water Resources Committee Advisory Group to this river basin management pilot (RBM pilot).

An important aim of this RBM pilot has been to gain and document local practical experience to improve future and further implementation of the river basin management. The development of River Basin Management Plans has not previously been undertaken in Myanmar but are now incorporated as a specific objective in the NWFD. The project team consisting of FD, IWUMD and NIVA hope that the experiences gained in this pilot can contribute to the process of developing adapted guidelines for RBM in Myanmar. This framework would build on the principles of; integration, participation, knowledge-based decision making, and an ecosystem management approach. We argue that more pilot cases from Myanmar are needed for obtaining the necessary experience from different contexts with various pressures, natural, biophysical and stakeholder conditions. We see the pathway towards IWRM as a continuous learning experience, and as a prerequisite for a continuous effort of water management in Myanmar. We do not claim to have reached the IWRM objectives within the three-year pilot, however, valuable experiences for further improvement have been gained.

Based on the experiences gained in this first pilot approach, this report present recommendations on the major steps for implementing the RBM approach on the following areas:

- Delineation of basin and sub-basin areas
- Coordination arenas and processes for the development of the sub-basin management plan
- Practical water management tasks and coordination of such

The report is a deliverable of the project, IWRM Institutional Building and Training, a collaborative effort by the Forest Department, The Irrigation and Water Utilization Management Department, and

the Directorate of Water Resources and Improvement of River Systems and he Norwegian Institute for Water Research (NIVA). An important aim of this project is to pilot the river basin management approach in Myanmar where the Bago River Sub-basin has been selected as the pilot case study area.

The *Chapter 2* in this report present the background of the river basin management approach, including sub-sections on the historic perspective on water management in Myanmar and participation. *Chapter 2* also presents the project's approach for the river basin management pilot in Bago. *Chapter 3* presents the project's discussion and experience of delineating River Basin Areas, and Sub-basin Areas, along with some preliminary recommendations. *Chapter* 4 presents the project's experience of with regard to the platforms, the Bago Sub-basin Area Committee, and the Bago Non-governmental Stakeholder Group and the platform's purpose of enabling coordination of practical water management issues, discussion of decision-making issue needed for developing the River Basin Management Plan. Chapter 5, reports on the different steps within a systematic water management approach taken in the project, including practical water management tasks and decision making. Recommendations are presented, and further development and adaptation suggested. Chapter 6 sums up pilot achievements and challenges.

2 Background and the river basin management approach

2.1 The River Basin Management Approach

The River Basin Management (RBM) Approach, where river basin boundaries correspond to management boundaries, is an aim of the Myanmar NWFD, and also of a number of other international IWRM frameworks, such as the EU WFD and UNSECO IWRM guidelines (see also Hendry, 2015). According to the approach, water management should be coordinated in an integrated way within the river basin including surface waters, ground waters, and the marine influence area across administrative borders like states, regions, towns, and municipalities.

The argument for this approach is that water is best managed along its natural, hydrological boundaries. The tool used to enable RBM is river basin management steps, leading to the development of a coordinated River Basin Management Plan (RBMP). Management of river basins should be systematic and undertaken in specific cyclic intervals. Prior to the development of a RBMP (as step zero) the boundaries of river basins need to be identified and determined. The boundaries need be agreed upon and correspond with the administrative unit for each river basin, the so called "River Basin Area" (Zaw Lwin Tun et al., 2016), the coordination unit for decision making and for practical water management tasks.

Important aspects of the river basin management approach which needs to be specified on country levels include mechanisms for coordination, and participation. The river basin management approach also often refers to an ecosystem management approach and the aim of achieving good ecological status. This indicates the need of developing methods to assess and classify the ecological status (Eriksen et al. 2016). Country specific needs have to be considered when implementing the approach, such as when deciding the relevant administrative units for coordination and for practical work tasks. The transformation of water governance to a river basin management approach involves applying principles of coordination and participation, where implementation must be seen as a *process* of which society is part of.

EU WFD

The WFD Directive is a legal instrument aiming to achieve and maintain good status for all surface waters and ground waters within the European Union by the target date of 2015 (or 2021). The Directive refers to the river basin management approach and consists of 26 provisions/paragraphs referred to as 'articles'. All EU member states and Norway have transposed the EU WFD into national law. Other non-EU states such as Ukraine, and Moldova, have also adopted, or that is adapted a river basin framework which reflects the EU WFD.

The directive was developed in the late 1990 and implemented at the EU level in 2001 (European Commission, 2000). The development was a response to an increasingly fragmented legislation and mounting concerns among EU citizens regarding increased water pollution problems. The Directive is founded upon a number of IWRM principles and requires: water management to be based upon the river basin management approach; the integration of sectors, authorities and stakeholders; and the participation of all those involved (Nesheim and Platjouw 2016).

the Common Implementation Strategy (CIS) is an important part of the EU WFD. The strategy's objectives are to develop a common understanding, share experiences, and create synergies and networks for a successful implementation. The work on a CIS has resulted in various Guidance Documents and resource documents related to different aspects of the implementation of the WFD into national law. The Guidance Documents are intended to provide an overall methodological approach, though not tailored to specific circumstances of each EU Member States[1].

According to the CIS, the implementation of the WFD can be seen as a cyclic water management process after phase zero intended for the development of the river basins administrative approach within each nation. The cyclic water management process refers to six years and can be seen to cover three phases: characterization, water quality assessment and setting of environmental goals (step1-4), development of river basin management plans including programme of measures (step 5-6) implementation of measures. Thereafter, the process starts over again, though skipping the initial characterization. The second round the cycle starts with an evaluation on the impact of measures (operational monitoring) and updating environmental goals. The different phases and the affiliated steps will be further described below.

UNESCO IWRM guidelines

The UNESCO IWRM guidelines (2009) were developed by the International Hydrological Programme (IHP) to raise awareness of the importance of an integrated approach to water resources management at the river basin level, and to address the practical implementation of IWRM. The purpose of these guidelines is to be an instruction manual that synthesizes practical IWRM methodologies to help practitioners implement IWRM at the river basin level. The guidelines consist of two parts: the overarching principles of IWRM at River Basin Level, and a practical guide intended for use by practitioners of IWRM. The practical guide consists of guidelines for IWRM coordination (Part 2.1), guidelines for flood management (Part 2.2), and an invitation to IWRM for irrigation practitioners (Part 2.3).

The UNESCO guidelines defines the objective of IWRM at the river basin level to improve water resources management through progressively developing water resources in the basin, by building on a more integrated institutional framework and improving environmental sustainability. The guideline refers to a number of successful examples of implementing the approach in different river basins in the world, including the Brantas River (Indonesia), the Buyuk Mendez River (Turkey), the Lake Biwa (Japan), the Negro River (Argentina), and the Davao River (Phillipines).[2]

In order to make the UNESCO guidelines more operational, four steps or action points have been identified. These action points evolve in spirals of repeated steps as one moves towards more coordinated water resources management. The iterative process of spirals are water management cycles where the primary objective of each cycle is to produce a river basin plan based on a coordinated effort by the different sectors for effective implementation. This should, according to the guidelines, be considered as an open-ended process. It is emphasized that sound water resources management is important for a variety of human development related areas such as food security, health, environment, industry, and gender equality. However, the guidelines emphasised in that it is the river basin's specific set of circumstances, which ultimately determines the goals of the river basin plan.

[1] Documents produced by the Common Implementation Strategy process can be found on the WFD CIRCABC library
[2] UNESCO, 'IWRM Guidelines at the River Basin Level, Part 2-1: The Guidelines for IWRM Coordination', p.59-155.

2.1.1 Participation- a central part of water and environmental governance

To ensure that local knowledge and priorities are taken into account in water resource management, participatory approaches including a range of different stakeholders are used. Participatory approaches to development emerged after a growing discontent with top-down and technocratic development interventions that failed to consider local priorities and that were unsuited for the realities they sought to improve (for accounts of the origins of participatory processes please see Cornwall and Jewkes (1995) and Chambers (1981, 1994), Mohan and Stokke (2000)). Participation seeks to allow the people who are affected by a specific challenge to themselves analyse the problem, make decisions and device solutions that fit their wants and needs, rather than having external experts doing it for them. By allowing people to assess problems and find solutions on their own terms, participatory approaches are also meant to empower communities and catalyse people to take action. Participation is moreover linked to the legitimacy and effectiveness of environmental policy and planning and participation of stakeholders is central to governance, as participation is important for a legitimate *approach. It can be argued that successful participation is a situation which is dependent on trust and good experience of meaningful former interaction. Achieving successful participation must be seen as a process in countries, where such approaches lack a strong tradition.*

Participation can be defined as:

> A process by which individuals and groups of people come together in some way to communicate, interact or exchange information and provide input around a particular set of issues, problems or decisions and share in decision making to one degree or another. Thus, participation as a concept may cover everything from mere information sharing with stakeholders, to involvement of stakeholders in collaborative committees where discussions and planning of actions occur (Leigh, 2004).

Participation is embedded as a democratic right for citizens for example in the 1998 Aarhus Convention (see Hartley and Wood, 2005). Beyond participation in environmental decision-making as a normative right, there are several pragmatic benefits claimed to arise from involving stakeholders in environmental decisions, for example improved quality of decision, efficiency and legitimacy.

Participation critiques and best practices

Participation and involvement of stakeholders is nowadays often an established component of most development and environment-oriented projects. It is important to consider the balance for a community to participate in workshops and exercises without raising unrealistic expectations of what the project can deliver. A common critique of participatory processes is that communities are easily led to believe that the project can provide resources to solve problems the community identify. The expectation of external assistance may also influence how participants respond in some instances. While it is difficult to fully overcome the issue of realistic expectations, engaging in discussions with participants of what results the project can possibly achieve along with a more modest framing and a wider definition of empowerment may limit the problem. Another critique raised in participation (Cooke and Kothari 2001) is that local solutions are often only encouraged if they fit within the overarching project's plan and visions. Power relations within a community or between different stakeholders also need to be considered. Cooke and Kothari (2001) argue that participation processes can reinforce existing power structures and discourage minority perspectives. Furthermore, if people feel they are asked to partake in processes where they have little real influence, it is common that they develop participation fatigue. It should be acknowledged that various actors will enter participation on different premises with diverging hopes for what the process may generate and also with different abilities in making their voice and opinions heard

(Cooke and Kothari, 2001).To avoid common challenges and disillusions with participation, criteria preferred by participant has been listed as: using the best available scientific information, that participants have a real chance in influencing decision, that the process promote communication and learning and that all participants are treated as equals (Chase et al., 2004).

In the literature reviewed by Reed (2008), best practice stakeholder participation is summarized in seven different points. This includes ensuring that the facilitator is capable of handling group dynamics and that the goals of the process are clear and communicated to the participants. The quality of the participatory process itself determines the outcomes and the quality of the decision. Successful examples of stakeholder participation need to consider participation as a process rather than as a specific methodology that can be achieved by performing different activities within a tool-kit mentality. Methods and the degree of participation believed to be appropriate for the environmental issue and clearly stated and agreed upon with the participants. Again, it is important that stakeholders both have a real say in influencing a decision and that they have the capacity and knowledge to do in a meaningful way. To provide participants with education about the problem at hand may therefore be necessary. It is recommended that the role stakeholders should have within the process as a whole e.g. problem and solution definition, implementation and monitoring is carefully thought out prior to the process. Furthermore, Reed (2008) note that who is considered relevant to participant and what stake they have in the environmental issue at hand must be discussed before the process. Finally, best practice cases include highly skilled facilitation, that local knowledge is acknowledged and integrated with scientific knowledge and that participation and how to use decisions taken by stakeholders enjoy some level of institutionalization.

IWRM and participation

Stakeholder participation along with institutional adaptation and procedural innovation to enable participation is assumed to be essential to the effectiveness of river basin planning and the environmental outcomes of the water framework directive (WFD) (European Commission 2003, Jager et al. 2016). Stakeholder participation along with institutional adaptation and procedural innovation to enable participation is assumed to be essential to the effectiveness of river basin planning and the environmental outcomes of the water framework directive (WFD) (European Commission 2003, Jager et al. 2016). Public participation is according to the WFD guidance document divided into three levels: (i) information, (ii) consultation and (iii) active involvement. The two first levels shall be ensured, and the third level shall be encouraged. It is up to the member states to develop their own strategies to ensure participation, which has led to variations on how, to what extent and during what phase of the planning process stakeholders are involved across the EU. The need to determinate and communicate what role stakeholders should play and what they can expect appear particularly pressing but also challenging.

A review of participation across six EU member states concludes that, “While broad engagement of “all interested parties”, including the general public, communities and stakeholders, at all stages of the planning process has not materialized, perhaps the emergent “advisory board” model and the selective involvement of organized stakeholders will prove to be the most feasible and effective means of stakeholder engagement for competent authorities” (Jager et al., 2016). It may be noted however, that participation of economic sectors, such as agricultural and hydropower organizations, have been sought more actively than for example environmental NGOs (De Stefano, 2010). A general concern regarding participation refers to the mandate of non-governmental stakeholder participation, that the stakeholders are often dissatisfied with their ability to actually influence management.

The main difference between the River Basin Organization model and the Non-governmental Stakeholder Group refers to the system for participation. In a River Basin Organization model, authorities and non-governmental stakeholders are together in the same discussion platform; whilst with reference to the other model, non-governmental stakeholders have their own discussion platform, apart from a River Basin Committee. The latter model which comprises one platform for authorities (the Committee in this pilot) and another platform for non-governmental stakeholders (in the Group in this pilot) also requires a system to ensure dialogue between these two platforms. The Non-governmental Stakeholder Group will discuss decision-making issues and prepare input to the River Basin Area (RBA) Committee. This system is in line with that of the EU WFD.

2.2 Historic perspective on water management in Myanmar

This section provides a brief overview on the history of water management in Myanmar. This history is important for understanding current water management practices, institutional responsibilities and identities relating to water and environmental management and needs to be considered as part of recommendations for implementation of river basin management in Myanmar. The history of management, along with the more recent institutional development of management of environmental matters are also reflected in the Bago pilot implementation of the river basin management.

In Myanmar, management of water has traditionally foremost concerned: irrigation of agricultural land for food security, reservoirs and management to avoid flooding, and management to ensure navigable rivers. These topics have mainly been the responsibilities of the sectoral ministries, the Ministry of Agriculture Livestock and Irrigation (MOALI), and the Ministry of Transport and Communications (MOTC). MOALI through its Irrigation and Water Utilization Management Department (IWUMD) has the responsibility of providing efficient and good quality irrigation water, and for monitoring water quality for irrigated areas, and also of monitoring drinking water from surface area sources (reservoirs). MOTC through its Directorate of Water Resources and Improvement of River System department (DWIR) has a specific responsibility for the efficient and safe navigation in waterways along rivers and creeks and for protecting the river systems for the beneficial utilization of the public. DWIR is also responsible for monitoring of water quality in main river systems. MOTC through its Department of Meteorology and Hydrology is responsible for data collection and analysis of hydrology. The Ministry of Health is responsible for monitoring of drinking water quality from ground water sources.

Environmental issues, and herein water was first identified as an institutional responsibility in 1990, when the Ministry of Foreign Affairs (MOFA) established the *National Commission for Environmental Affairs (NCEA)* (Kattelus, 2009). This Commission included around 20 members from various departments and sectorial ministers to ensure representation of sector interests. In 2011, the NCEA was reformed to be the National Environmental Conservation Committee (NECC), now serving as the focal organization for environmental matters, reporting directly to the Presidential Cabinet. NECC was chaired by the newly established Ministry of Environmental Conservation and Forestry (MOECAF)[3]. MOECAF was reformed in 2016, to be the Ministry of Natural Resources and Environmental Conservation (MONREC). As a result of designating a ministry to be responsible for environmental matters, a number of policies, strategies and plans relevant to environmental and

[3] From 1948 to 1992, forestry and agriculture were represented by one ministry, the Ministry of Agriculture and Forests. Between 1992, and 2011, forestry and agriculture were represented by separate ministries. Since 2011, when the Ministry of Forestry was reformed to be, the Ministry of Environmental Conservation and Forestry (MOECAF), forestry has been represented by the Department of Forestry under MOECAF.

watershed management have been adopted over the last decades (Nesheim and Platjouw 2016). MONREC has been responsible for the development of an EIA framework, and as part of its mandate of being responsible for the environmental matters, the ministry also has a core responsibility for watershed management.

In March 2014, the NECC split to form an environmental committee, the Environmental Conservation Committee and the National Water Resources Committee (NWRC). The NWRC, established in July 2013, consists of Union Ministers, Regional Ministers, Mayors, Permanent Secretaries, Director Generals, and representatives (Chair, Secretary and Joint Secretary) of the Advisory Group Members. It takes responsibility for the overall management of national water resources and for the enhancement of integrated water resources management in the country. Before the establishment of the NWRC, no institution had the overall responsibility for the management of national water resources in the country. The NWRC has formulated policies and guidelines on water resource management; it primarily focuses the inland fresh water resources and management in rivers, lakes, reservoirs and dams. In terms of marine influence water resources, NCRMC named as "National Coastal Resources Management Committee" were formed in 2016 to be responsible for water resources along the coasts. The management of river basins that cover marine influence like Rakhine State, Lower Ayeyarwady, and Tanintharyi Region calls for two national platforms and their high-level coordination. A core responsible of the latter NCRMC platform is to implement "Integrated Coastal Resources Management by an integrated and inclusive approach. That committee is led by Vice President (1) with a total of 20 members including union ministers, permanent secretaries, director generals and 6 chief ministers from six coastal regions and states while the NWRC by Vice President (2).

The NWRC has been developing two important water related policies, the NWP and the NWFD. It is furthermore mandated to develop a new holistic water law in Myanmar. These policies reflect that it has on union national level been decided to implement an IWRM approach on river basin levels in Myanmar

The NWP:
NWP, section 13.4 states that, IWRM taking river basin / sub basin as a unit should be the main principle for planning development and management of resources, and it further details,

> *"Appropriate institutional arrangements for each river basin should be developed to collect and collate all data, inter alia to deal with and enable establishment of basin authorities with appropriate powers to plan, manage and regulate utilization of water resources in the basin".*

The Myanmar NWFD:
NWFD, Objective 5, defines the approach by clarifying that,

> *"River basin areas have to be designated, not according to administrative or political boundaries, but rather according to the river basin (the spatial catchment area of the river) as a natural geographical and hydrological unit".*

2.2.1 Participation in Myanmar; its history and the present

In Myanmar, traditional structures for informing the public, and of involving the public in local governance regimes exist. These typically consist of local voluntary groups regarding environment, health, and religion. At the national level, there is currently no specific setup for participation of non-governmental stakeholders with regard to water management. In a workshop to discuss participation on local, regional and national level organized by the IWRM project on September 24th at the Summit

Parkview hotel in Yangon, participants argued that it would be relevant and correct to develop a national level platform for NGOs and CBOs. The purpose would be for this platform to provide feedback to discussions in the NWRC, and the NWRC AG on water management and water policy development. However, it was concluded that the establishment of such a platform at the present would be premature. Instead, it was argued that it would first be necessary to implement participation procedures on regional and local level before going national.

Presently, national level organizations are invited to open meetings; it is not known however, the frequency, and representativity of organizations at such events. The consultation meetings in 2014 held across the country initiated by the NWRC to share the draft Myanmar NWFD for feedback represent an important national level initiative (NWRC, 2014). It is stated in the NWFD document (NWRC, 2014; 1): "*The intention of those consultations was to share the MNWFD draft document, seek comments, input and advice from the Civil Society and non-state actors to further improve the draft Framework Directive. Also, opportunities were given to various stakeholders to work more closely with the Advisory Group of NWRC and members of NWRC during the Myanmar National Water Law drafting process*».

Local level participation; Traditionally, village participation in Myanmar could be described as a "household heads system", whereby groups of ten households from nearby villages select a representative. This representative participates in the village tract/ward administration, which is responsible for organizing public meetings for consultation. These public meetings are the only option for participation available to people, hence the character and the frequency of such meetings may serve as an indication of the extent to which different sectors consult citizens on planning and decision-making (UNDP 2014). The extent that people are engaged in public meetings or are given the opportunity to participate in public meetings varies depending on the individual Ward Administrator /Tract Administrator (UNDP, 2014).

On a township level, the Ward/Village Tract Administration Law of 2012, the first legal framework prescribing a set up for involvement, states that representation in Township and Village Tract Development Supportive Committees (TDSC) must be elected among the representatives in the village tract /ward administration. The TDSCs are actively involved in the decision-making process regarding the selection of projects for development funds. Though these funds are limited, they stimulate increased interaction between government and citizens.

2.3 The River basin management pilot approach in Bago

The River Basin Management approach in the Bago Region has been completed according to the workplan of the IWRM project. This workplan was developed as part of group work during a week in September 2014 in Oslo by WFD-FD, IWUMD and NIVA, with input from DIWR. The workplan was inspired by the partners experiences with IWRM, and by the EU WFD Common Implementation Strategy (European Commission, 2000). The project workplan identifies the major activities to be implemented in Sittaung River Basin and in the Bago River. On the more specific and detailed level, however, the workplan can be characterized as a living document allowing for substantial flexibility in adapting the plan to the specific situations encountered. The workplan has been updated every half year by the project team; and as the pilot has progressed, the secretaries of the Committee the Group have influenced the activities specified in the workplan. We also want to stress that coordination with actors working in other project in the same sub-basin has had an impact on updated workplans; both with regard to synergies and also to avoid overlap of activities. Feedback from the NWRC AG about every half year on progress and plans for the pilot has also been important input for updating workplans.

The project pilot was initiated by a workshop on the RMB approach at Irrigation Technology Center (ITC) in Bago on March 2015 and will be completed by the delivery of the Bago Sub-basin Management plan to the NWRC by the Committee chair and main secretaries of the Committee and the Group in November 2018. The approach has included, administrative river basin management, involvement of non-governmental stakeholders, and practical water management tasks. This approach has been important for enabling knowledge-based decision making, and for anchoring decisions in the perspectives held by various authorities and interests. The project has primarily used the Myanmar NWFD policy and the EU WFD as IWRM reference frameworks, these frameworks refer to assessment of ecological status of waters. It is important to emphasise that work for river basin management in Bago, is planned to continue as part of a second phase of the IWRM project for a five-year period (2019 – 2023), where the RBM approach will furthermore be expanded into other sub-basis in the Sittaung River Basin.

There has been a common understanding in the project team that this RBM pilot should be implemented according to a step by step approach to enable a contextualised and a "learning by doing" process. The approach has been important to allow for reflections on achievements and constraints; which reflects core objectives of the adaptive management concept (Pahl-Wostl 2002). The adaptive management (AM) concept focuses on linking iterative social learning with policy, implementation and subsequent evaluation. It takes the perspective that management and behaviour can be improved by learning from experience if behaviour is modified in light of that experience. It is based on an understanding that systems to be managed are, complex, unpredictable and characterized by unexpected responses to intervention and by changing circumstances in the coupled social-ecological system. The pilot implementation of the River basin approach in Bago has sought to follow a strategy of adaptive management by adjusting the process to the available information and knowledge, the technologies available, economic factors, culture, and institutional set up in the sub-basin. In line with the adaptive management strategy, we stress that the pilot should be viewed as a first attempt for implementing the river basin management approach. Enabling coordination, knowledge-based decision making, involving non-governmental stakeholders and taking a holistic perspective are all aspects requiring continuous improvement and attention. In consideration of aspects to be improved, we refer to Blackstock et al. (2012) and the criteria presented as relevant to the process of developing the plan:

- *Was there sufficient and understandable information provided for discussion and decision making?*
- *Was there sufficient time provided to achieve their objectives?*
- *Did some organisations or individuals dominate proceedings?*
- *Was the appropriate leadership provided?*
- *Do the resulting plans reflect the input of wider stakeholders?*
- *Was the process transparent?*
- *Do the plans reflect the input of non-governmental stakeholders?*

3 Delineation of River Basin Areas

The initial step for implementing the river basin management approach is to delineate river basins units to encourage an ecosystem based and territorially more integrated approach to solving water problems. Put shortly, this approach considers interconnectedness of water within the territory. In a purist approach one would focus primarily on hydrology and topography as input for the delineation of river basin units. However, in many cases it is difficult to define the territorial boundaries of a natural resource because of its complex interdependence with broader ecosystems, and because of human alterations of water ways by for example constructing channels diverting water in new directions. There are also often issues related to the political legitimacy of decision making and funding mechanisms (Olson, 1969; Moss, 2012; Metha et al., 2017). That aside, identifying river basin hydrological boundaries based on best available and agreed knowledge among national experts is an important starting point for discussing administrative boundaries of river basins. In this project, the "River Basin Area"[4] is defined as the administrative unit for river basin management. The scale of identified River Basin Areas should reflect the scale of larger development and infrastructure projects and territory being impacted by or influencing such projects. Typical examples are hydropower and irrigation developments projects. Policies related to this type of large development projects are typically decided on national level, although in nations with a federal system of states, such as USA and Germany, this may be more decentralized (Moss et al. 2004). Extensive experience has shown that smaller catchment units (Sub-basin Areas) are more suited for practical water management as these smaller units can enable closer coordination of practical water management tasks between authorities and improve participation.

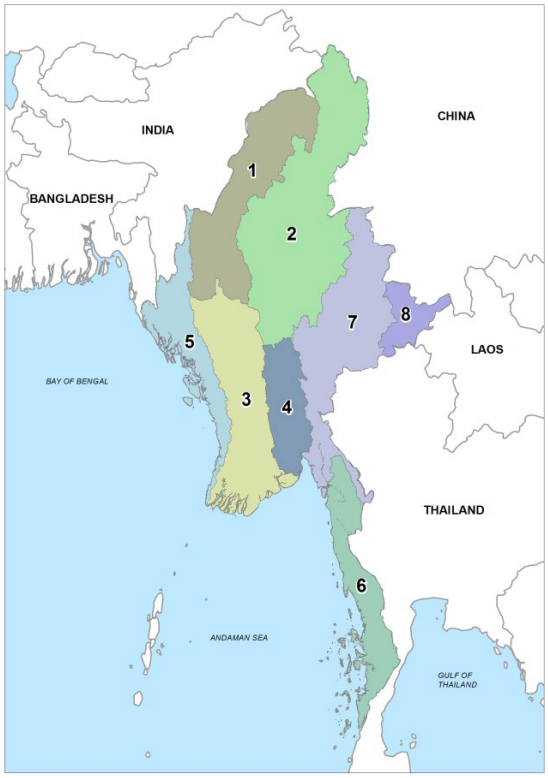
Each Sub-basin Area is nested within the larger River Basin Area. The relative size of each sub-basin area, however, is a trade-off between allocation of administrative efforts, time and resources and the objective of being close to management decisions. In European countries, the sub-basin unit typically includes the main river and its tributaries, but often considers relevant administrative borders too.

The development of the administrative set up and related governance issues in Bago as a part of the IWRM project is presented in Chapter 4. In this chapter, we report and reflect on the efforts undertaken in the project to delineate River Basin Areas, and Sub-basin Areas. In section 3.1 we outline how the delineation procedure was organized for the Sittaung River Basin Area, including Sub-basin Areas. In section 3.2 we present an attempt to identify possible Sub-basin Areas in Myanmar, excluding coastal areas. Recommendations presented in this chapter are partly based on the experiences of this pilot, and partly refers to a broader set of literature on experiences in implementing the river basin management approach in other countries.

3.1 Delineation of the Sittaung River Basin Area, and Sub-basin Areas

Six river basins are usually identified for Myanmar, and there are also two coastal areas, the Rakhine State and Tanintharyi Region (Figure 1). The Sittaung River Basin was selected for this pilot as it is a relatively small basin with few conflicts. We highlight that the delineation activity of this project has not been mandated by top level national, and the approach presented can therefore not be seen as an ideal. Rather, the presented approach serves as an example on how delineation of a River Basin Area for administrative purposes can be undertaken.

[4] It was decided in initial discussions on the river basin management approach, to call the administrative river basin unit, River Basin Area, the EU WFD parallel is, River Basin District.



1. Chindwin
2. Upper Ayeyarwady
3. Lower Ayeyarwady
4. Sittaung
5. Rakhine State
6. Tanintharyi Region
7. Thanlwin
8. Mekong

Figure 1. River basins in Myanmar (*Source:* adapted from Win Kyaw, WWD, 2014).

The steps of delineating the Sittaung River Basin Area undertaken in this project

1. **The geographical, hydrological boundaries of the Sittaung River Basin**: As an input to the process of delineating river basins, hydrological boundaries were not yet agreed among relevant national authorities. Already agreed hydrological boundaries among national authorities would have been preferred. In the project approach a topographic map presenting the hydrological boundaries of the Sittaung River Basin was prepared by the MONREC GIS section. This map represented a baseline for discussing the boundary of the Sittaung River Basin Area.

2. **Discussing the fit of the hydrological boundary with other considerations related to an administrative River Basin Area**: Two workshops in March and September 2015 at ITC in Bago were organized to discuss the river basin management approach and the delineation of Sittaung River Basin Area, and Sittaung Sub-basin Areas (Zaw Lwin Tun et al., 2016). The workshops included 50 -60 attendants from different ministries and departments from the Bago and Taungoo Districts. The topographic map with hydrological boundaries was provided as input to the discussion along with a presentation on the approach. It was emphasised that judgments need to be made with regard to the area where the river enters the seas, around the outlet/ the delta area.

The workshop resulted in four different proposed versions of a “Sittuang River Basin Area” on a gradient from mainly political administrative boundaries – to a version which considers strictly hydrological boundaries (Zaw Lwin Tun et al., 2016). Those in favour of considering mainly current political administrative boundaries were sceptical of the hydrological alternative argued that areas with high conflict level would be difficult to integrate. After the two workshops, bilateral interviews

with most Bago Departments, and also a meeting with the NWRC AG members were conducted for feedback and for further discussions of where the Sittaung River Basin Area, and Sittaung Sub-basins boundaries should be drawn.

The initial workshops to present the river basin management approach and the delineation activity to all relevant departments allowed for group discussions and input from the different departments. This meeting format opened to the different perspectives of actors and enabled a plenary discussion of the benefits and drawbacks of the proposed alternative River Basin Areas versions.
The plenary approach also ensured that all attendants had access to the same information. The subsequent bilateral meetings with key actors occurring over a period of about eight months, enabling an iterative approach, and a process where actors were given possibilities to ask questions, and clarify issues. The final agreed version of the Sittaung River Basin Area considers hydrological boundaries, but also the political unity and history of the Bago District.

3. The Sittaung River Basin Area: the result of the delineation process

The Sittaung River Basin Area: The *hydrological* Sittaung River Basin Area covers most of the Bago Region and smaller parts of six other Regions and States, Shan State, Kayin State, Kayah State, Mon State and Nay Pyi Taw. There are 23 major tributaries to the Sittaung River. The Sittaung River is linked to the Bago River by a 61 km long canal. The final agreed alternative considers the Bago-Sittaung canal combining the Sittaung River with the Bago River (Figure 2). Due to this situation, the two rivers do not strictly belong to different hydrological river basins; rather the Bago River can be seen as a tributary of the Sittaung River as water from the Sittaung runs into the Bago River. Activities upstream in the Sittaung may therefore impact the situation downstream in the Bago River. This agreed alternative also considers the political unite within the Bago District with reference to overall decision making and coordination as it can be seen as beneficial to avoid splitting the District in two RBAs (Figure 2).

The Sittaung Sub-basin Areas: To ensure due consideration of local perspectives and to facilitate for coordination of practical work tasks, delineation of River Basin Areas into Sub-basin Areas is recommended. The sub-basin unit commonly includes the main river and its tributaries and often considers relevant administrative borders too. The whole River Basin Area needs to be split into Sub-basin units. The proposed Sub-basins within the Sittaung River Basin Area are listed below. The proposed Sub-basin Areas consider the Sittaung canal combining the Sittaung River with the Bago River. Though these two rivers are not strictly within the same hydrological river basin, the Sittaung River can be seen, as a tributary of the Bago River since water from the Sittaung runs into the Bago River. This proposal largely reflects current political administrative borders, and to a lesser extent the hydrological issues. After a meeting with national level authorities to discuss delineation of Myanmar sub-basin areas in March 2017, the following Sittaung Sub-basin Areas are proposed (Figure 2).

Upper Sittaung Sub-Basin Area: Tatkon, Pyinmana and Lewe Townships in Nay Pyi Taw Union Territory; Pinlaung Township in Shan State (Taunggyi district); and Pekhon Ttownship in Kayah State.

Middle Sittaung Sub-Basin Area: The Taungoo, Oak Twin, Tantabin, Yay Da Shay, Phyu, Kyauk Ta Ga, and the Kyauk KyiT Townships in Taungoo District and Than Daung Gyi Township in Kayin State.

Lower Sittaung Sub-Basin Area: Bago, Kawa, Thanatpin, Waw, DaikU, Nyaung Lay Bin, and Shwe Gyin Townships in Bago District, and Kyaik Hto and Bilin Townships in the Thaton District in Mon State.

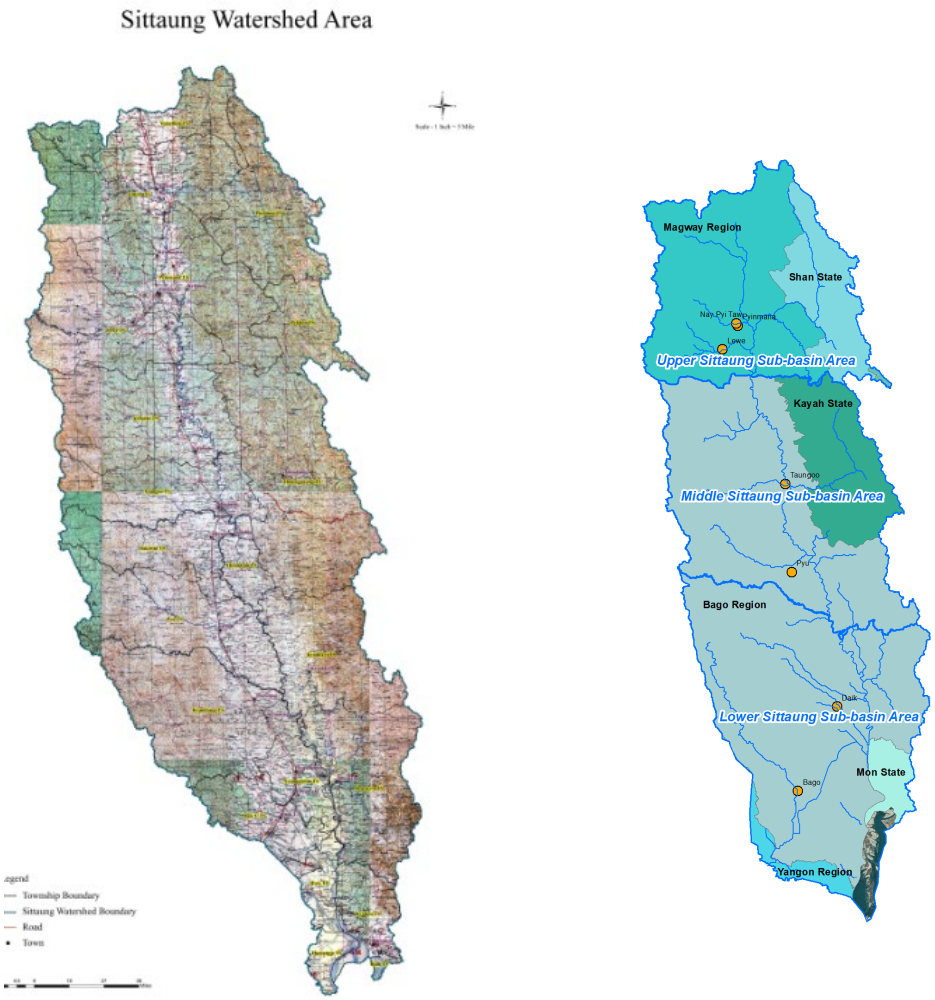


Figure 2. *Left:* The Hydrological Sittuang River Basin Area (Source: Ministry of Natural Resources and Environmental Conservation MONREC); *Right:* The map shows the suggested Sub-basin Areas within the Sittuang River Basin, the Upper Sittuang Sub-basin Area, the Middle Sittaung Sub-basin Area and the Lower Sittaung Sub-basin Area.

3.2 Delineation of Myanmar River Basin Areas, and Sub-basin Areas

The project approach to a discussion of River Basin Areas, and Sub-basin Areas in Myanmar included: preparation work to identify existing hydrological boundaries, rivers, considering topographic maps, and political administrative maps; and information about population densities, ethnic issues and environmental pressures. Based upon these categories of information, potential Sub-basin Areas for Myanmar were identified as a baseline for discussion. A workshop was organized where national level authorities from FD, IWUMD, DWIR, and DMH were invited to discuss sub-basin area boundaries. This section presents a first initiative of delineating the sub-basin; the knowledge base considered for identifying Sub-basin areas and the subsequent discussion and reflections. The initiative focussed on inland areas, as coastal areas are more difficult to delineate; as a river basin enters the sea as “a tip” at the outlet, there will be small triangles between the river basins that are not covered. These areas have to be split and shared with neighboring RBAs in the most suitable and appropriate way; considerations which have been out of the scope of this project.

1. **The knowledge base for identification of Sub-basin Areas**
   - The availability of hydrological maps of river basin were limited, hence as an alternative, topographic maps to identify and study rivers and streams and direction of flow. Based on such information, a simplified map presenting rivers and streams in Myanmar was prepared (Figure 3).
   - GIS files with catchment information received from MONREC; also google earth was used.
   - Sub-basin Areas, the unit for coordination of practical water management tasks and participation of non-governmental stakeholders typically also political administrative units for identification of boundaries. For information on Myanmar districts and township boundaries, we consulted the website; *https://www.citypopulation.de/php/myanmar-admin.php*) which enables identification of boundaries and district and township names. The website also contains information about population densities.

2. **The initial process for identifying Myanmar Sub-basin Areas**
   - Using information gained from topographic maps, we produced maps presenting Myanmar rivers and catchment areas (Appendix C), maps of district and townships boundaries as GIS shape layers to enable a view where the above specified information could be considered simultaneously for the same area. GIS shape layers could be added or removed depending on the view required.
   - We identified initial Sub-basin Areas based on the topographic, hydrological, and political administrative maps and by using the GIS tool, and knowledge on environmental pressures, and conflicts in the different area by the project team; the IWUMD and the WMD FD.
   - Workshop and discussion: Attendants from IWUMD, DWIR, DMH, and FD (national level) discussed March 2017 at IWUMD in Yangon the first proposed Sub-basin Areas. A presentation explained the approach, and an interactive power point presentation described the different layers and the rationale for the proposed potential Sub-basin Areas. It was explained that extensive iterations and feedback would be needed from Region and State governments, and Region and State actors before a final version could be produced.

     The presentation showed that most districts and townships have area within Sub-basin Areas. This means that the administration and the population within a district or township will be influenced by policy decisions in other districts and townships. The river basin management approach enables the opportunity for actors to influence decisions having an impact on water resources in their own jurisdiction.

3. **Feedback from workshop attendants**

   It was emphasized by the workshop attendants that knowledge about hydrological boundaries was important for delineating sub-basin areas and that this should be the first input. Here, the Myanmar “one map” project was mentioned (Myat Su Mon, 2016). It was also argued that knowledge about pressures, similarities in administrative boundaries within catchments are important for delineating sub-basin areas. Some proposed Sub-basin Areas were suggested to be combined, to form larger Sub-basin areas. This referred to: Yu River – where the first suggestion indicated the possibility of dividing this into two Sub-basin areas, while it was in the meeting argued for keeping the catchment of Yu River as one Sub-basin Area. It was suggested to include the rivers of Samon and Zaw Gyi (Lower Ayeyarwady River Basin Area) into one Sub-basin Area instead of each of these referring to a separate Sub-basin Area. It was emphasized by all attendants that the suggestions presented should merely be intended as a starting point for further discussion.

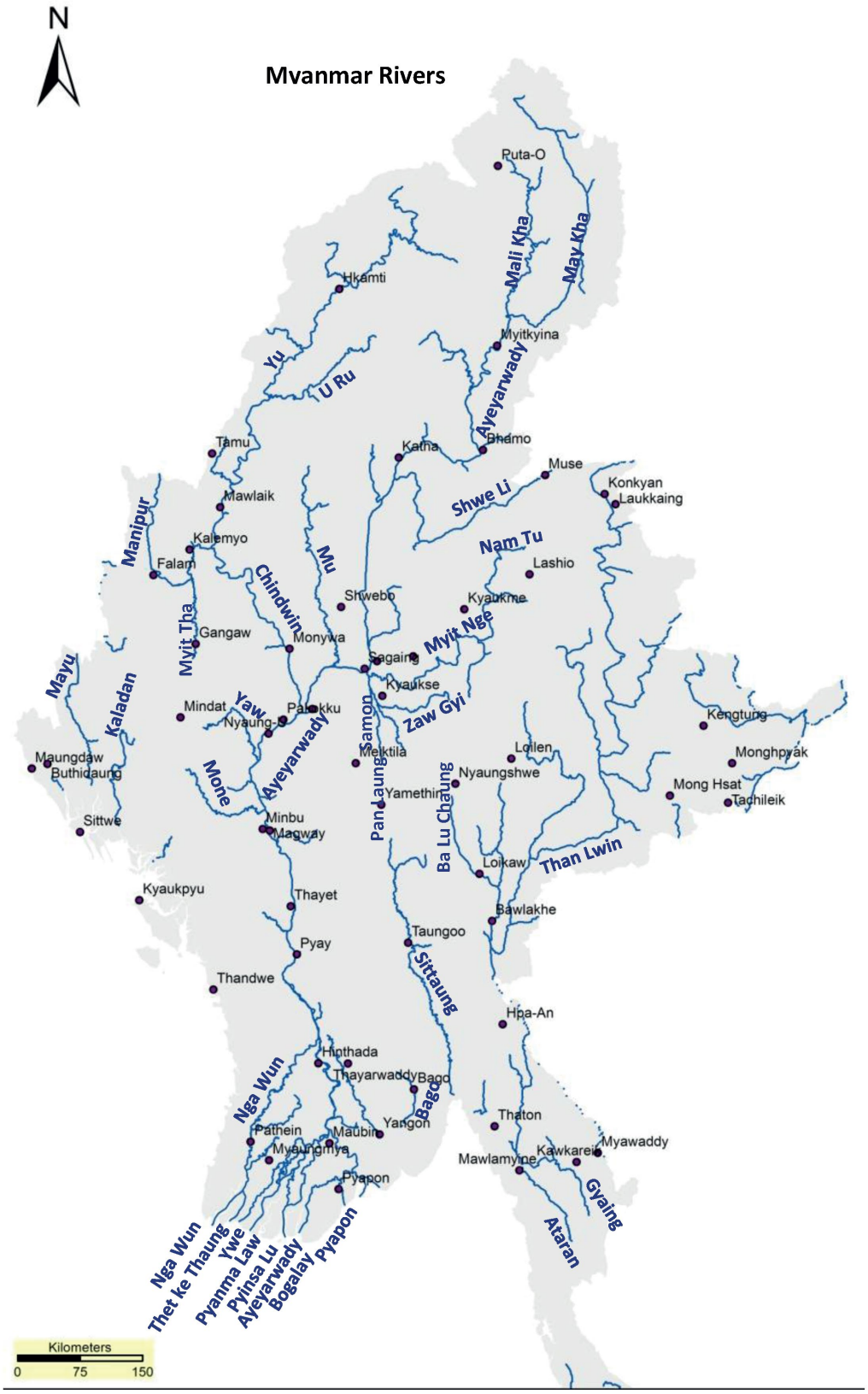


Figure 3. Main rivers in Myanmar, the map does not cover the Tanintharyi Region (Prepared by Hla Oo New, 2017)

3.3 Reflections and recommendations to delineation of river basin areas

The following recommendations are based on discussions from the three workshops and on various bilateral interviews with authorities, experts and stakeholders, organized as part of the project' Integrated water resources management – Institutional building and training'.

Based on our experiences, the project team support the view that smaller Sub-basin Areas better accommodate coordination among sector and environmental authorities, and involvement of stakeholders.

An initial top down approach to delineate for River Basin Areas and Sub-basin Areas is recommended to avoid uncertainties of the results. A top down approach should specify whom to be responsible, and whom to be involved in the activity of delineating River Basin Area, and Sub-basin Area boundaries. Thereafter an open invitation for actors to comment on proposed boundaries should be organized, a so-called hearing process. Proposed boundaries need to be agreed on national level, and on State and Region level (Hluttaw), and by the sector and environmental authorities.

Widely available GIS material: It is recommended that the geographic coverage of river basins should be introduced into a government appointed geographic information system (GIS) widely available. Determining a River Basin Area (RBA), the administrative river basin unit, involves identifying the main rivers within the RBA together with a precise description of the boundaries of the river basin.

Cross-disciplinary perspectives: The delineation process should consider different types of perspectives such as hydrology, political legitimacy, population density, ethnic, cultural issues. This is particularly relevant for delineation Sub-basin Areas: hydrological boundaries of rivers and tributaries, district boundaries – and township boundaries, location of important pressures upstream, transfer of water and history of collaboration are all relevant factors to be considered.

The size of a Sub-basin Area – the scale: It is recommended to specify and delineate Sub-basin Areas within the River Basin Area to ensure local involvement and for better coordination of practical water management tasks. It is in this project identified preliminary Myanmar Sub-basin Areas for coordination of practical water management tasks, and for development of sub-basin area management plans. Yet, the project team emphasise that more experience is needed to better understand what ideal Sub-basin Areas scales are. There may be a need to revise what are Sub-basin Area scales after more experiences have been gained and evaluated. Hence, first suggested Sub-basin Areas should not be too rigid, but rather be flexible for amendments. The issue of sub-basin area scale refers to a trade-off between the objective of being close to stakeholders and management issues, and the administrative burden of many platforms, and network procedures.

4 The administrative approach for development of River Basin Management Plans

The river basin approach (where water resources are managed according to ecosystem boundaries) enables addressing upstream and downstream interdependencies, water and land use interactions, and considering ecosystem functions. These issues are not well addressed when using conventional political administrative boundaries. Furthermore, hydropower generation, and inland water transport require a basin approach (World Bank, 1993; UN-ECE, 1995; Ekstrom and Young 2009). Despite the many potential benefits, practical applications of river basin management have demonstrated problems of spatial fit when reorganising water management around natural boundaries. Case studies show that the approach may create difficulties in collaborating with policy fields not organized around river basins, such as urban development, agriculture, forestry, transportation, and energy supply (Mostert et al. 2007, Pahl-Wostl et al. 2007). A focus on the territorial unit of the river basin in a broader context of overlapping social, economic, political, and physical spaces is therefore needed. Notably, in the most recent debates on the spatial fit of governance, arguments say that there may not be an ideal spatial fit, as both ecosystem boundaries, and institutional boundaries can be hard to define (Galaz et al., 2008; Moss, 2012; Huitema et al. 2009. It is highlighted that when discussing administrative river basin management, it is important to consider the mechanisms and strategies that favour institutional interplay (Moss, 2004). Negotiation and bargaining processes with other parties relevant to water resource management and the creation of new platforms such as river basin organizations to solve basin-specific problems are important approaches. In this chapter we discuss the challenges, opportunities and mechanisms, which may be required for coordination and participation within the frames of river basin management. We furthermore present the processes and the experiences of establishing platforms for coordination and participation for IWRM in Bago.

4.1 Integrated Water Resources Management at different administrative levels

With reference to the EU WFD, the IWRM approach reflects a multilevel governance set up comprising networks spanning horizontal and vertical levels. The "horizontal" dimension refers to co-operation arrangements between regions or between municipalities / townships, while the "vertical" dimension refers to the linkages between higher and lower levels of government, including their institutional, financial, and information sharing aspects.

National level: Implementing the river basin approach on national level involves identifying coordination mechanisms on the national, regional, and local level. National level coordination is required for identifying procedures, deadlines and objectives, processes and mechanisms across ministries to be implemented in all River Basin Areas, and Sub-basin Areas and what will be flexible strategies to be decided by each respective decentralized institution. National level coordination is also relevant for a national level acknowledgement and approval of River Basin Area Water Management Plans.

River basin and sub-basin level: The focus on river basins and river basin authorities represents a decentralized type of governance. Typically two types of systems exist to promote water management within the river basin management administrative set up; this refers to, (i) the River Basin Organization including both authorities and non-governmental stakeholders to discuss in the

same platform (Schmeier, 2012), and (ii) a system which includes two platforms, one for coordination of authorities, and another platform for discussing and involvement by non-governmental stakeholders (Heldt et al. 2017; Euler and Heldt, 2018). The EU WFD article 14 specifies a requirement for participation, but it does not specify how the system for coordination of authorities and involvement should be implemented in each specific country. Yet most countries in Europe have established a system of two platforms, one for coordination of authorities, and another for involvement of stakeholders (Figure 4). On the Sub-basin Area levels (the local level), in many places it is common to use a flexible system where non-governmental stakeholders are included in the committee can be found. Overall the specific institutional set up varies among European countries, and there is an ongoing discussion of what best practices consist of (Moss, 2012; Ruiz-Villaverde and García-Rubio 2017; Euler and Heldt 2018).

Below we briefly present the vertical and the horizontal river basin administrative set up in Europe, and we further comment on the Myanmar situation as background for the experience of pilot implementation of the river basin approach in Bago during 2016 and 2018. The remaining of the chapter present the process of developing the two platforms for discussion in Bago.

The national level coordination of water management: A national level platform for coordination to clarify contradictory aims and regulations includes national level authorities. The degree however, that such an institution is formalized as part of implementing the EU WFD varies among European countries.

Myanmar: A parallel national level institution in Myanmar refers to the National Water Resources Committee (NWRC) formed in 2013. The NWRC in Myanmar has an ambitious mandate, as it is also responsible for water law and policy development. Another important national level institution is the National Coastal Resources Management Committee (NCRMC) formed in 2016 to be responsible for water resources along the coasts.

The regional level (river basin level): According to the EU WFD, the coordination arena for development of river basin management is the River Basin District Council[5] (European Commission, 2003). The Council typically includes authorities from different political administrative units within the basin, and one of these is selected to be the river basin authority. This is commonly an institution downstream in the basin (Nesheim and Platjouw, 2016). The river basin management plan is developed based on dialogue with national level authorities, and with local authorities, and with input from non-governmental stakeholders. The River Basin Plan highlights issues relevant on river basin level and presents a summary of the sub-basin plans, with the respective sub-basin level plans (reports) as attachments. Regional parliaments give authority to the plan. The Basin Plan is typically submitted to a national level ministry group for approval. Some countries in Europe have also established a river basin organization. However, the mandate and the authority of these river basin organizations are different from the River Basin District Councils. A river organization may be a formal legal body, but less formal arrangements also exist. Typically, a river basin organization refers to some kind of collaborative arrangement between the public sector and stakeholders, community groups, economic sectors, non-governmental organisations and private enterprises. Functions refers to such as monitoring activities, discourse and awareness and planning activities (Schmeier, 2014).

Myanmar: No system which parallels the European system of River Basin District Council has been established in Myanmar; in Myanmar there is no a river basin institution which has received the authority by national level authorities to develop a river basin management plan guided by

[5] A Myanmar parallel could be the River Basin Area Committee.

operational rules corresponding to an agreed water management cycle. It is, however, important to mention River Basin Organization initiatives: The Ayeyarwady River Basin Organization was established in 2012 for the aim to produce people-centered science-based research for the healthy Ayeyarwady basin (ARBRO.org), and the Chindwin River Basin Organization, established to improve management of water resources and river health (SEI, 2015). These initiatives represent important experiences, which must be collected and reflected upon as part of identifying operational rules for a river basin management approach on national level in Myanmar. It is important to reflect on the authority of such river basin organizations relevant to national level authorities.

Local level (sub-basin level: A number of different practical water management tasks are better coordinated at Sub-basin Area level by a Sub-basin Area Committee. The common situation in Europe is a platform for coordination of relevant activities on sub-basin level. Typically, data collection of chemical, hydro-morphological and biological quality elements is the responsibility of the respective sector departments on regional level. It is common to develop a Sub-basin Management Plan, which corresponds to the River Basin Management Plan. In many places practical water management tasks have a strong connection to municipality level. The set up for involvement varies among countries and sub-basins (Ruiz-Villaverde and García-Rubio 2017; Euler and Heldt, 2018). Involvement set ups also includes temporary partnerships related to specific issues arising.

Myanmar: There is no sub-basin level institutional set up for water management mandated by national level authorities. The IWRM project represents an important pilot for gaining experience on implementing a systematic water management involving a knowledge based approach, coordination of authorities and involvement of stakeholders for the production of a sub-basin management plan. Experiences with regard to coordination of authorities, and involvement of non-governmental stakeholders however, may, also be gained from projects such as the Meikthila Lake Basin Project, and from the coordination and management platform, Inlay Lake Authority established for Inlay Lake. The Inlay Lake Authority was formed and notified on 6th July 2015 and includes topic specific working groups where relevant departments are represented. The platform has a mandate to manage and allocate funds for relevant operations in the Lake. No legal and formal communication has been established however between Inlay Lake Authority and the national level platform NWRC. Significant attention has been paid to the management and conservation of Inlay Lake as the Lake is an important tourist attraction in Myanmar.

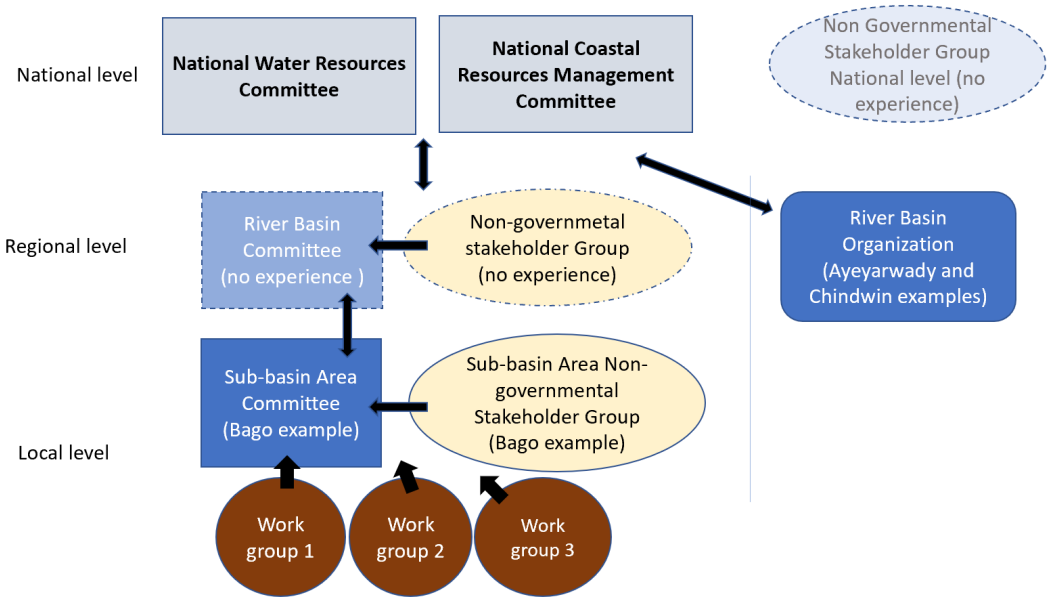


Figure 4. The figure partly reflects the current Myanmar situation; the dotted figures refers to non-existing institutions in the Myanmar. In Bago, work groups which are related to the Bago Sub-basin Area Committee, consisting of both authorities and non-governmental stakeholders being topic related, e.g. waste, flood, are being established.

4.2 The Bago administrative approach for river basin management

Water management in Myanmar is characterized by a centralized and strong sectoral division of responsibilities, a parallel situation to the situation also in other countries (Moss, 2012). Regulations, planning, policy-making and enforcement powers are mainly divided between different water authorities on national level, and in Region and State governments. The aim of participation is acknowledged in several recent promulgated laws and policy framework[6], yet operational rules for participation in Myanmar is lacking. Moreover, authorities are largely inexperienced in participatory, cooperative forms of governance beyond formal consultation exercises.

It was as part of implementing the IWRM project, decided to implement river basin management in Bago by following some overall steps and principles of the EU WFD (Guidance Document no. 8: Public participation in relation to the Water Framework Directive, European Commission 2003). This has involved developing an arena for coordination among authorities, the Bago Sub-basin Area Committee, and another arena for discussion among non-governmental stakeholders, the Bago Sub-basin Area Non-governmental Stakeholder Group. The purpose of these platforms has been to enable discussion and coordination of practical water management issues, and for decision making related to the steps of developing the River Basin Management Plan (Figure 4, Figure 6). An important argument for establishing separate platforms for authorities and non-governmental stakeholders is to enable a platform where non-governmental stakeholders can discuss and present perspectives outside the domain of authorities (UNESCO, 2016). To enable input by non-governmental stakeholders to process of developing the Sub-basin Water Management plan, bridge meetings and dialogue strategies between the Committee and the Group were agreed upon and practiced (Appendix A, B).

[6] Laws referring to participation refers to among others; the Environmental Conservation Law (2012, The Forest Law (1992).

Establishing River Basin and Sub-basin Committees involves aspects of institution development and institution building. 'Building' is said to refer to creating new institutions from scratch, and 'development' to improving existing institutions (Van Reenen and Waisfisz, 1988; Cleaver, 2002). In this context, new ways of interacting in this multi-level governance network need to be developed and best practices established, and we emphasise the following related points (Moore et al., 1995):

(i) Institution building is not a mechanical activity, but requires adaptiveness to the specific political, cultural, economic context.
(ii) Institution building involves, at some level or other, changes in social relationships. Such changes often generate resistance. There should therefore be substantial commitment to the process on the part of both the people directly concerned and (with some scope for trade-offs) the people who have power over the organization/institution concerned.
(iii) Successful institution building requires effective and proactive leadership
(vi) Skills of organization or management development specialists

4.2.1 The Bago River Sub-basin Area Committee

The development of the Bago River Sub-basin Area Committee followed a stepwise approach which can be described by, (i) an initial workshop to discuss sub-basin coordination, (ii) the administrative work of the Committee in the pilot work, and (iii) development of Terms of Reference for the Committee (TOR). To combine an approach which considered the administrative set up in combination with practical water management tasks, the coordination arena focused on the smaller catchment of the Bago River Sub-basin Area level, rather than covering the whole Lower Sittaung Sub-basin Area being[7] (Chapter 3). The smaller unit favoured closer relationship with actors; possibilities for “thick discussion” that is direct dialogue and trust building; it also enabled a broad coverage of sampling stations within the pilot case area. The pilot however, did not gain experience in coordination across administrative units; districts, states or regions (Nesheim et al. 2017).

Initial workshop to discuss sub-basin coordination
The project organized the first discussion on the topic of a river sub-bas basin coordination and discussion platform for the implementation of the river basin management approach on September 2015 at ITC in Bago. Information water management practices in Myanmar, and about sector water quality monitoring practices in Myanmar was presented by IWUMD, DWIR, and this served as background for the development of the Bago River Sub-basin Area Committee. The main international reference point for the discussion included a presentation of the EU WFD guideline on how to implement an administrative river basin management approach.

The workshop discussion results emphasised that the common practice for governance of committees in Myanmar is identifying a secretariat, and a chair. A “secretariat” is responsible for inviting to meetings, preparing agendas, and ensuring that the timeline is followed, while the chair is responsible for decision making. The following departments were identified as important for water management in Myanmar: IWUMD, DWIR, MONREC, FD and ECD. GAD was identified as important for coordination on vertical and horizontal levels (Zaw Lwin Tun et al., 2016). The workshop did not decide specific positions of departments in this project.

The administrative work of the Committee in the pilot:

[7] The Lower Sittaung Sub-Basin Area as delineated in the IWRM project, includes the, Bago, Kawa, Thanatpin, Waw, DaikU, Nyaung Lay Bin, and Shwe Gyin Townships in Bago District, and Kyaik Hto and Bilin townships within Thaton District, Mon State.

The Committee met five times during the 2016-2018 to discuss: 1. Prioritizing water management issues; 2. environmental objectives; 3. program of measures; 4 prioritizing program of measures; and 5. a final meeting with representatives from the Committee. For "bilateral" discussions on the approach, and for close feedback on reports, the project team met the secretaries of the Committee and in addition four times, (i) to discuss the TOR, (ii) to get feedback on the Characterization report (Eriksen et al., 2017), (iii) to discuss the final version of the Programme of Measures, (iv) to discuss the continuation of the RBM in Bago after submitting the Bago River Sub-basin Management Plan. The development of the Bago River Sub-basin Area Committee has been a gradual approach, the overall organizational structure was decided upfront, but the ownership of positions has been a gradual approach.

The terms of reference and the mandate of the Bago Sub-basin Area Committee
A practice in this pilot has been that Committee meetings are opened and chaired by the Bago MONREC Minister. Based on this practice it was in 2017 discussed and agreed among the core Bago departments, the IWUMD, DWIR, and FD to elect the Bago Ministry of Natural Resources, Forests and Environmental Conservation (MONRFEC) Minister as chair of the Bago Sub-basin Area Committee. The rational for this decision is that MONREC is responsible for environmental management in Myanmar, a responsibility in line with the NWFD aim of good ecological status. Furthermore, MONREC in this pilot is the responsible ministry. During the period of this pilot, it was first Kyaw Min San (from 2016 to 2018), and following him, the chair has been Saw Nyo Win.

The Bago FD, the Bago DWIR, and Bago IWUMD have all had specific positions in this river basin management pilot; in the initial workshops to discuss delineation, and in all Committee meetings. Opening remarks have been presented by Bago directors of these departments in all meetings. In the first Committee meetings, IWUMD national level with Dr Zaw Lwin Tun and FD national level with Bo NI and Dr. Toe Aung facilitated for the approach. Increasingly, Bago level departments have taken responsibility. In 2017, Bago FD with Zaw Win Myint was elected to be the head secretary of the Committee, and Htay Aung of DWIR, and Ko Oo of IWUMD were given the task of being co-secretaries. In 2018, it was decided to also include ECD, and Bago Township Development Committee as secretaries.

Mandate of the Committee, the Chair and of secretaries of the Committee were confirmed and agreed by the parties June 2018 (Appendix A). The mandate of the Committee is to take responsibility for the development of a River Basin Management Plan for the RBA. The Members of a RBA Committee should embrace all relevant sector and environmental authorities within the (political)-administrative units of the River Sub-basin Area. The TOR had then been discussed in bilateral meetings with the chair and the secretaries of the committee in 2017 and in early 2018.

4.2.2 The Bago Non-governmental stakeholder Group

As a parallel to the establishment and development of the Bago River sub-basin committee, the project development of the Bago Sub-basin Non-governmental Stakeholder Group followed a stepwise approach: (i) an initial workshop, (ii) the work of the Group, and (iii) mandate and terms of reference for the Group secretaries.

The initial workshop to discuss participation: The participatory approach as part of the river basin management approach was first discussed in a workshop in Bago on March 2016. NGOs, CBOs, private actors, elected members township level were invited to discuss the issue of participation and around 50- 60 people attended the workshop. The questions to be discussed were presented up front in a concept note distributed along with the invitation to attend the workshop, to enable

preparation by attendants. Questions to be debated included: 1. *Who should be consulted on a Sittaung River Basin Management Plan? 2. On what issues is there a need for consultation? 3. What is the best way to distribute information, documents to stakeholders and the public? How should these stakeholders or interest groups be organized*?

The workshop listed the following actors to be consulted as part of the process of developing a Bago Sub-basin Management Plan: farmers, fishermen, floating timber laborers, factory owners, industrial businesses, political parties, elected hluttaw members.

Regarding dissemination of project information to stakeholders the following channels were mentioned: media outlets, radio, TV, telephone, internet, social media such as Facebook, social networks, policy briefs, posters and awareness seminars and discussion meetings. It was specified the need to arrange meetings on local village level.

It was agreed in this workshop to establish an organization of Non-governmental Stakeholders; the Bago Sub-basin Area Non-governmental Stakeholder Group. It was furthermore decided in this workshop that the established Non-governmental Stakeholder Group should follow a parallel process to that of the Committee, with organized meetings for the discussion of the different decision making steps for development of Bago Sub-basin Area Management Plan.

The administrative work of the Non-Governmental Stakeholder Group in the pilot
In total during the period from 2016 to 2018, the Group met four times for deliberation and discussion: 1. Prioritizing water management issues (October 2016); 2. environmental objectives (March 2017); 3. First discussion on program of measures (June 2017); 4 prioritizing program of measures (November 2017). Prior to meetings attendants received information sheets, folders on the including minutes from the Committee meetings in own languages.
Progress regarding Group development has been achieved: during the first few meetings, attendants were getting familiar with the river basin management and the IWRM concepts, and also the setup of discussions. An important step forward regarding Group institution building referred to the election of Group secretaries on March 2nd, 2017. Since them, the social relationship among the secretaries has been improved, and the secretaries have been increasingly active in meetings and events. As the Group secretaries were give the responsibility for inviting to Group meetings and other events, also participation in meetings have increased.

During 2017 and 2018 the elected secretaries were given an increasingly larger role, the secretaries were invited to discuss terms of reference to the chair and the committee secretaries, and also terms of reference and mandate for the Group and the Group secretaries in bilateral meetings, and to comments on reports; on September 25th, 2017, February 15th and May 25th, 2018. An important final event of the pilot refers to the Open seminar on September 20th, 2018 for presenting the Bago River Sub-basin Area Management Plan, where all six secretaries, the three Committee and the three Group secretaries presented their inputs to this process.

The organizational structure of the Bago Non-governmental Stakeholder Group
Three secretaries to the Group were elected March 2017. In this project pilot, the secretaries referred to: Dr. Hein Thant Zaw, the main secretary, and the co-secretaries Mg Kyi and Aung Myo Htut. The election was supported by the other attendants at the Group meeting, but there was no formal election procedure organized. After election the secretaries were given the responsibility of presenting opening and closing remarks at every meeting, and to make sure that invite

representative non-governmental stakeholders receive invitations. The project facilitators were responsible for leading the meetings.

In June 2018, the mandate and the terms of reference for the non-governmental secretaries were confirmed and agreed by the parties (Appendix B). The TOR has been discussed in bilateral meetings with the secretaries, allowing also for comments by the Committee secretaries and the chair. The mandate of Non-governmental Stakeholder Group and the secretaries is to provide input prior to all important processes/ steps of preparing the River Basin Management Plan.

Figure 5. *Left*: From final meeting to discuss Programme of Measures at FD in Bago, May 2018; *Right*: Second Committee meeting to discuss environmental objectives in Bago, November 2016.

Reflections on the project approach

The Bago pilot approach can be described as a type of collaborative governance (Ansell and Gash 2007; Emerson et al. 2011) as it has focused on bringing multiple stakeholders together for deliberation and for the purpose of developing an agreed (consensus based) Bago Sub-basin Management Plan. It can, in the context of IWRM in this project, be argued that a collaborative governance regime is needed for effective coordination of different sector and environmental authorities, and for ensuring the involvement of non-governmental stakeholders. Yet collaborative governance may not be easily achieved as it depends on shared understanding between different institutions and the type of interactions with other institutions. Effective collaborative governance requires a process where a shared understanding of problems and the perspectives of the other actors have been established, and where commitment to shared goals and outcomes are achieved (Huxham, 2003; Imperial, 2005). Such factors are encouraged by face-to-face communication, trust building, transfer of knowledge time-consuming processes that requires willingness and long-term commitment. A ladder of coordination may be described and the different steps of: 1. Mediation achieved (information and knowledge sharing); 2. Common discussions and deliberation, opinion formation, coordinating world views; 3. adjusting behaviours to avoid externalities or gain synergies; and 4. Joint measures, co-management (see Hansen, 2015). Regarding the Bago pilot important achievements for a coordinated approach have been reached with reference to; 1. mediation, and 2. common discussions and deliberation.

Improvements for more representative participation, and for information sharing to all non-governmental stakeholders on village level are objectives for the future. Important questions relate to, how can participation be ensured on the sub-basin level (local level), and on river basin level (regional level) and how can perspectives of the different levels are included and considered. Moreover, how can we operationalize gender and ethnic or marginalized groups representation, and can we avoid conflicts between groups? This involves also including vulnerable groups within the

population and avoiding skewed influence of participants. Representation is particularly important for including local knowledge that can improve both the suitability and fairness of environmental decisions relating to communities and specific local settings.

Further advancements need to be gained on institutional interplay and new forms of cross-sectoral governance. This pilot did not focus on difficult areas of collaboration. It was a project strategy not to attempt for difficult issues, but rather focus on the process for enabling a shared understanding of the situation. We foresee that conflicts of interest regarding the need for economic development and industrial development, agricultural production, and reforestation along the river banks are likely to be high in those areas where measures are deemed necessary.

Recommendations for an administrative approach for river basin management issues relevant for both the Committee and the Group

- *Access to information by authorities and Non-governmental Stakeholders*: An administrative set up for river basin management needs to specify access to information and ways of distributing information to stakeholders and the public. Information needs to be accessible for all stakeholders, both by means of text in familiar languages and presented in an easy manner.

- *Integrated approach: Water managers have to adopt a more integrated approach to water protection they will need to cooperate to a far greater extent than in the past with organisations outside the sphere of water management. Support will be needed from other policy fields relevant to water use, in particular those with a major influence over land use: agriculture, land-use planning and nature conservation.*

- *Attendance by Committee or Group members*: should meet a certain number of times during the year to discuss and to reach an agreement on specified issues. Actual attendance by the specific authorities in Committee meetings, however, depends on the relevancy of the meeting agenda for their area of responsibility. If the topics on the Committee meeting agenda does not have relevancy for the authorities in a (political)-administrative area, attendance at the meeting should not be required.

- *Awareness raising:* Awareness campaigns can be launched at the village level, in schools for example, and should inform of IWRM and river basin approach, and the benefit of healthy rivers. For raising awareness about water quality and water management issues, schools need to receive news briefs and background information about water resource management. Direct involvement of civil society needs to occur at the local level. Social media is an important channel for awareness raising and information dissemination.

- *Financial resources*: It is important to allocate additional financial and work force resources to these institutions to enable them to do the required tasks.

Recommendations relevant for the Committee

- *National level support:* There is a need for strong support by a broad specter of national authorities, such as the National Water Resources Committee, both in terms of clear objectives of the approach, guidelines on the process, and necessary financial resources.
- *Members of a River Basin Area Committee* should embrace all relevant sector and environmental authorities within the (political) administrative units of the River Basin Area. All authorities which

may affect the water situation with their decision, or whom could be affected by the decision in the committee, should have the possibility to take part in the discussion.

- *Avoid bias of decision making*: When selecting the institution to represent the chair; certain criteria should be considered; the chair should not be inclined to favour a particular sector.
- *A clear mandate for decision making*; a clear mandate for decision-making in the committees is needed; which issues are better approached the river basin scale, and which issues is better suited for decision making on sub-basin (townships) or the national level[8]

Recommendations relevant for the Group

- *Establishment of a Non-governmental Stakeholder Group*: procedures and the structure for participation is the responsibility of national governments and parliaments. The degree that procedures for participation is specified, or not included national rules and laws largely determines the position of civil society actors. Yet, successful participation is not straight forward, but dependent upon a range of factors, often context dependent, and these vary according to practice and economy, and culture.
- *Who should be consulted as part of the river basin management approach*: There is also a need to further specify by law which interest groups should be consulted and in related to which processes
- *Participation on local and basin level*: To facilitate the formation of a Non-governmental Stakeholder Group, a first workshop meeting can be organized by the secretary to inform of the RBA approach, the mandate of the NGS Group and resources available for the Group. and when stakeholders should be consulted and how. On the *River Basin Area* level, relevant Non-Governmental Stakeholder Group members may be regional Hluttaw members, and also NGOs, civil society organizations and human rights activists on national and regional level. On *Sub-basin Area* level the NGS Group should include membership of township level elected people's representative and township Development Supporting Committee. Village tracts /wards representatives may have meeting rights and should be invited if the topic is relevant, that is if the decision in any way may impact the specific village.

  An invitation to be part of a reference group should be quite broad; however, if the reference group becomes too big it may not serve its purpose. A solution may be to create more than one reference group, or sub-groups. Such sub-groups could arise to exist only temporary due to some particular current issue.

[8] For example, ecological water quality standards, or the drinking water standard should be decided upon on the national level, while actions/measures for erosion control is typically an issue for the river basin level.

5 Practical water management tasks and decision making in the Bago River Basin Management pilot

The development of a holistic river basin management plan is an important tool for enabling integrated water resources management. The development of such a plan can facilitate for management within the territory of a river basin and for coordination of actors. Yet, for sector authorities to actually be able to use the plan, environmental aims need to be harmonized with sector policy aims. The planning process for developing the plan needs to be inclusive, predictable and supported by the main water related departments. To reach the decided environmental objectives stated in the plan, decision-making also needs to be knowledge based. Development of the plan requires multilevel negotiation and decision-making, and the plan needs to consider the perspectives of various actors in the basin. As an introduction to presenting the process of developing the Bago River Sub-basin Management Plan, we present in section 5.1 the theories and perspectives on management and decision-making which have guided our approach in Bago. In section 5.2, we present the main practical management steps undertaken in the project as part of developing the Bago Sub-basin Management Plan. Some reflections and recommendations are presented in section 5.3.

5.1 Management and decision-making theories considered

The IWRM project in piloting the RBM primarily draws on theories of *adaptive management* (Pahl-Wostl, 2002) and of *adaptive governance* (Folke et al. 2005 Lemos and Agrawal, 2006*)*. These theories are based on the notion of existing uncertainties, and of coupled social-ecological systems (SESs), which mean that human activities influence ecosystems and vice versa and that these interactions should be viewed holistically as one system. Waterways can be conceived as a SES as the various human activities and interests interact with natural processes, climate variability and change. SESs are co-evolving and interlinked and sometimes changing in unpredictable ways (Folke et al. 2005). *Adaptive management* takes these dynamics and the inherent uncertainties as a starting point and emphasizes that management needs to be flexible and make use of multiple perspectives and knowledge forms, considering that social learning and responsive management is part of the process. Learning should therefore be iterative and reflected upon in management and decision-making. *Adaptive governance* follows these principles, but concerns the overarching regulatory and institutional processes that can enable adaptive management. It builds on environmental governance (the regulatory processes, mechanisms and organizations through which political actors influence environmental actions and outcomes) (Lemos and Agrawal 2006:298) and SES resilience thinking; how to manage complexity and uncertainty of SESs (Walker et al. 2004, Folke et al.2005, Folke 2006). The objective of AG is to address environmental challenges in a way that is flexible, dynamic and sufficiently responsive to adjust environmental policy and practices when new problems occur. The adaptive governance approach emphasizes that decisions need to be flexible enough to address the specific context issues arise in and responsive to adjust to complex and unexpected feedbacks between social and ecological system components. In adaptive governance, flexible and learning-based collaborations and decision-making processes involving both state and nonstate actors, often at multiple levels with the aim to adaptively negotiate and coordinate management actions (Chaffin et al. 2014).

Different theories emphasize various aspects of decision-making *including consensus decision-making*, where members of a group support a decision that is good or acceptable for the group as a whole. This kind of decision-making is suitable for when decisions need to be approved by all main interest to be possible to implement efficiently. Such decisions may take the form of compromises leading to the acceptability but perhaps not preference of all for the decision. Processes meant to establish consensus often include rounds of deliberation in which the issue eventually is framed according to the needs of the group. *Decision-making by majority vote*, in contrast, does not require that all in the group agree with the suggested decision but that a majority of the members support it. Decisions taken by a majority run the risk of not acknowledging the needs and interests of minority groups and may also be harmful to the group dynamic if some members strongly oppose the suggested decision.

The Bago pilot can be described as an adaptive management approach, as this pilot aims to test the river basin management in the sub-basin. The pilot strategy is to use the EU WFD as a reference framework, with flexibility and adapt it to the Myanmar context. See chapter 4 on the project approach with reference to collaborative governance. Some characteristics emerging from the literature on environmental planning and decision-making have served as guiding principles in the Bago pilot. These include that; (i) the decisions should be based on *best available knowledge,* (ii) that several interests should be included and have a say in how and decision are taken and that the decisions should represent as many interests as possible and depending on the set up of the processes be taken largely in consensus.

The project team of FD, IWUMD and NIVA have served as facilitators for implementing the river basin pilot in Bago. This has involved a mediating role of explaining the purpose and the rational of the approach, and to ensure that the perspectives of the different sector departments, scientific experts, policy makers and societal groups and public interests were presented and considered. Every Committee and Group meeting were initiated with a PowerPoint presentation which included a recent update of the ecological status in Bago water bodies based on monitoring of water chemistry and biology (invertebrates). The purpose has been to facilitate for a common understanding of the situation and to provide an overview of the available environmental knowledge. Discussions were organized as group discussions lasting for about 45 minutes, where each group consisted of about 5-8 people. Each group then presented key points from their discussions. To enable preparing for meetings, an agenda and minutes from the previous meeting were disseminated to members of Committee and of the Group. These factors have been important for enabling an iterative approach, and a repetition of issues to be discussed. It has furthermore allowed for an increased understanding and awareness by members, and for new attendants to take part in the discussion.

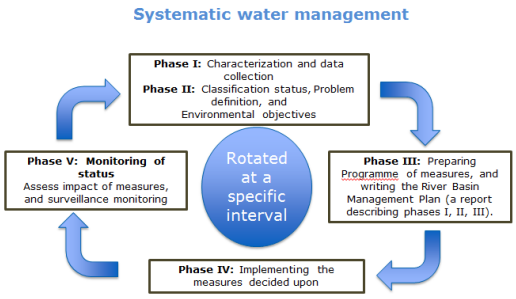


Figure 6. Systematic and cyclic water management tasks.

5.2 The steps of the water management cycle implemented in the Bago

The IWRM project by focusing on institution building and governance for improved water ecosystem function, monitoring of water quality, and development of ecological water quality criteria has enabled a holistic and interdisciplinary approach to the aim of developing the Bago Sub-basin Management Plan. The main Myanmar policy reference is the National Water Framework Directive (NWFD), which emphasizes river basin management to reach the objective of good status for all ground waters and surface waters. The seven directives within the MNWFD reflect the main principles of the EU WFD including: water management based on river basins; achieving good ecological status, participatory approach, decentralized approach, coordination, and getting the prices right. The approach is also in line with the goals of the National Water Policy which refers to: managing the water resources of Myanmar in an integrated, holistic and socially inclusive manner, to contribute significantly to the poverty alleviation, to the green growth and sustainable development of the nation, by providing access to water of equitable quantity and safe quality for all social, environmental and economic needs of the present and future generations (NWP, 2014). Furthermore, several national environmental strategies and objectives have been adopted in Myanmar the recent years, these too are important reference policies for this RBM pilot.

The project has aimed to implement knowledge based, coordinated and transparent river basin management for the long-term aim of good ecological status. The knowledge base in the project was enabled by monthly monitoring activities in by the FD and IWUM, and NIVA. Below are the different steps, including practical water management tasks and decision-making issues for developing the Bago River Sub-basin Area Management Plan described.

5.2.1 The work plan for development of the RBMP

The first step of the water management cycle (Figure 5) refers to a **tentative work plan; a timeline** for the practical tasks and decision-making issues needed to develop the River Basin Management Plan. *The timeline* for the different activities and the different decision making steps should follow national rules and regulations if such have been specified. The purpose of presenting a work plan is to enable stakeholders including government and non-governmental stakeholders, and the public to become aware of when to raise concerns or proposals, and to provide predictability of planned events. Open meetings may be organized to draw attention to this process in the respective townships, and written announcements may be included in local newspapers. The tentative workplan should be published and made easily available for feedback. It is furthermore important to inform and get feedback from the regional government and Hluttaw members on this work plan. The workplan needs to include information about the planning steps; data collection, assessment, definition of objectives, decision regarding measures, and of the participating authorities and agencies (who is responsible for doing what, and by when). It is also relevant to share upfront information about planned regional and local informational consultation meetings and events. The final work plan needs to be prepared and agreed within the River Basin Area and Sub-basin Area Committee, and the Non-governmental Stakeholder Group. The final workplan will allow local government staff to consult ministry level on processes to come.

***As part of the project pilot in Bago**, a workplan and timetable were agreed at the first Committee and Group meeting in September and October 2016, respectively*. No real consultation on the workplan prior to the meetings was undertaken, but it an effort was made to be predicable regarding the time schedule of planned meetings. Hence, every meeting ended by a short discussion of feasible dates for next meetings and topics of discussion, and roughly the process has followed the workplan agreed at the meetings in 2016. The National Water Framework Directive (Myanmar) specifies that

the water management cycle refers to a ten-year cycle; according to the EU WFD, the water management cycle refers to a six-year cycle. Within the frames of this project, the pilot has covered three years; with the implementation of measures specified in the Plan to follow in the coming years.

5.2.2 Characterization, data and classification of ecological status

Characterization of the catchment involves practical water management tasks for developing a common knowledge base in the basin. An agreed monitoring program, data collection and analysis efforts, data storage and availability are important issues for preparing a coordinated decision-making process.

An initial characterization provided background information for deciding the position of monitoring sites in sub-basin, and background information on water users and usages. Specifically, the network of monitoring sites needs to consider human impacts regarding the extent of point source and diffuse pollution within the basin, and nature's vulnerability to pollution based on geology, vegetation cover and landscape formations, and precipitation patters. Ideally data collection should also include an economic analysis of water usage to provide a basis for identification of fair and efficient economic incentives (Eriksen et al. 2017). The **monitoring program** needs to be approved in the Committee to ensure a coordinated approach as well as consistency, transparency and availability of data. Data that has historically been collected for characterization are typically organized in different types of databases. When a river basin approach is being implemented, data in databases ought to be reorganized into the "new" units with reference to the defined River Basin Area and River Sub-Basins units. In the NWFD, a water related data bank is highlighted as one of several key issues to be addressed.

Institutional responsibility: provisions to the law must determine and clearly state which institution should be responsible for data management and describe what this responsibility implies. A practical arrangement may be the establishment of a national institution, which takes responsibility for a databank which includes the basins and sub-basin in Myanmar. Important responsibilities include storing the data collected efficiently and securely. In this respect, it has been decided that a national database system is to be developed as part of the Hydro Informatic Centre (DWIR, 2017).

Classification of ecological status in water bodies[9]: To classify water quality elements according to a normative scale in Myanmar, reference conditions for each quality element for each ecological water type need to be decided. Related to this, criteria should be adopted / developed for describing chemical status, hygienic status, and ecological status for the defined ecological water types. Standards and ecological water types will be important reference points for setting ecological status classes.

The project approach to characterization; data collection, monitoring and classification of status
The Bago pilot referred to the EU WFD, article 5, and the NWFD[10] for information on needed monitoring efforts of water quality elements:

- *chemical and physio-chemical elements* (thermal conditions, oxygenation conditions, salinity, acidification status, nutrient conditions, specific pollutants, pollution by priority substances

[9] A water body may be defined as a as a coherent unit in the river basin in which the same environmental objectives applies.
[10] These quality elements are consistent with the elements described in the EU WFD (European Commission, 2000), but while the EU WFD provides a quite detailed description of the different aspects that have to be described, this is yet to be described in the NWFD.

identified as being discharges into the water body, pollution by other substances discharged in significant quantities into the body of water);

- *Hydro-morphological quality elements* (hydrological regime – quantity and dynamics of water flow, connection to ground water bodies, river continuity, morphological conditions, river depths and width variation, structure and substrate of the river or lake bed, structure of the riparian zone); and

- *Biological elements* (composition and abundance of aquatic flora (rivers), composition and abundance of phytoplankton (lakes), composition and abundance of benthic invertebrate fauna, composition, abundance and age structure of fish fauna).

An initial field work was undertaken for analysis of chemical water quality in 2015 in the Bago River. Based on this first analysis of water quality a sampling campaign was specified and initiated in February 2016. The purpose of this campaign was to provide background information for development of ecological water quality criteria, and for characterization. Data on water chemistry, macroinvertebrates and hydromorphology, was collected from Dawe in the north to Yangon in the south. Locations for data collection were selected to cover as much of the river basin as possible. NIVA together with the Irrigation and Water Utilization Management Department (IWUMD) and Forest Department initiated a water chemical monitoring program for the Bago River Sub-basin and the South-Eastern part of the Sittaung River basin. Both scientific information and expert based information were collected (see Mjelde et al. 2016; Eriksen et al. 2017).

Water quality parameters that are known to be sensitive to human pressures, and have ecological impacts, were chosen for the monitoring program. Physico-chemical parameters were: pH, turbidity, suspended solids, alkalinity, calcium (Ca), potassium (K), chloride (Cl), magnesium (Mg), sodium (Na) and sulphate (So), total nitrogen, nitrate, phosphate, total phosphorus, ammonia. River-basin specific pollutants were: copper (Cu), chromium (Cr), manganese (Mn), iron (Fe) and arsenic (As). The EU's priority substances were mercury (Hg), cadmium (Cd), zinc (Zn), nickel (Ni) and lead (Pb). Analysis of bacteria (*E. coli*), chemical and biological oxygen demand are also undertaken. The data have been analysed partly in Yangon at the laboratory of the IWUM and partly at NIVA in Norway as well as in the newly rehabilitated laboratory at the Forest Research Institute at Nay Pyi Taw.[11]

Data management: The data are available through the projects database: http://www.niva.no/myanmar/water-quality-database-system. A server has been installed at the FD and the aim is to provide access to data to government staff, and also to members of the Non-governmental Stakeholder Group (Figure 7). The project team see accessibility of data is essential for communication and coordination regarding the state of ecological and chemical status of waters, However, local management of the database is still under progress in the project, and it is realized that access to data is not only dependent upon availability of data, but also on experience, familiarity on the use of databases. Further training sessions in the sub-basin are needed.

[11] The rehabilitation and instrumentation of the water quality laboratory at FRI is an activity within the IWRM project.

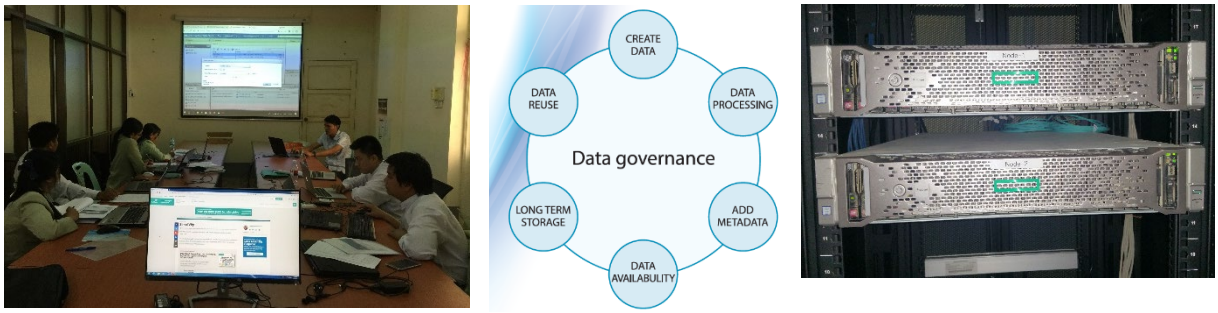


Figure 7. *Left*: from the database rom at the FD; *Middle*: the different components of data governance; *Right*: the database server installed at FD as part of the IWRM project.

Ecological status assessment: The EU WFD normative *ecological status levels*; poor, bad, moderate, good and high status, were used to classify ecological status in Bago (Figure 8). According to the EU WFD, if a water body is classified to have good and high status, no action other than monitoring is required. The IWRM project contributes with effort to develop criteria for ecological status assessment in Myanmar (Mjelde et al., 2017; Eriksen et al., 2017; Ballot et al. 2018). There is not yet sufficient data to define class boundaries for macroinvertebrates, physical-chemical elements, specific pollutants and hydromorphology, therefore the first classification is somewhat explorative. It is however, feasible to identify sites with no or low impact from highly impacted sites (Figure (8). The preliminary classification led to grouping of water bodies into one of the three categories: "**at risk**", "**possibly at risk**" or "**not at risk**". **At risk** means that there is significant alteration in the ecological quality, while **possibly at risk** means moderate alterations or that there is not sufficient information to decide, and **not at risk** means no or slight alteration. The preliminary classification helped to identify problem areas where monitoring should be focused, and furthermore where measures should be implemented. Areas in forested areas with no or few human settlements are not at risk, whereas areas downstream the Bago City are clearly impacted and at risk (Eriksen et al., 2017).

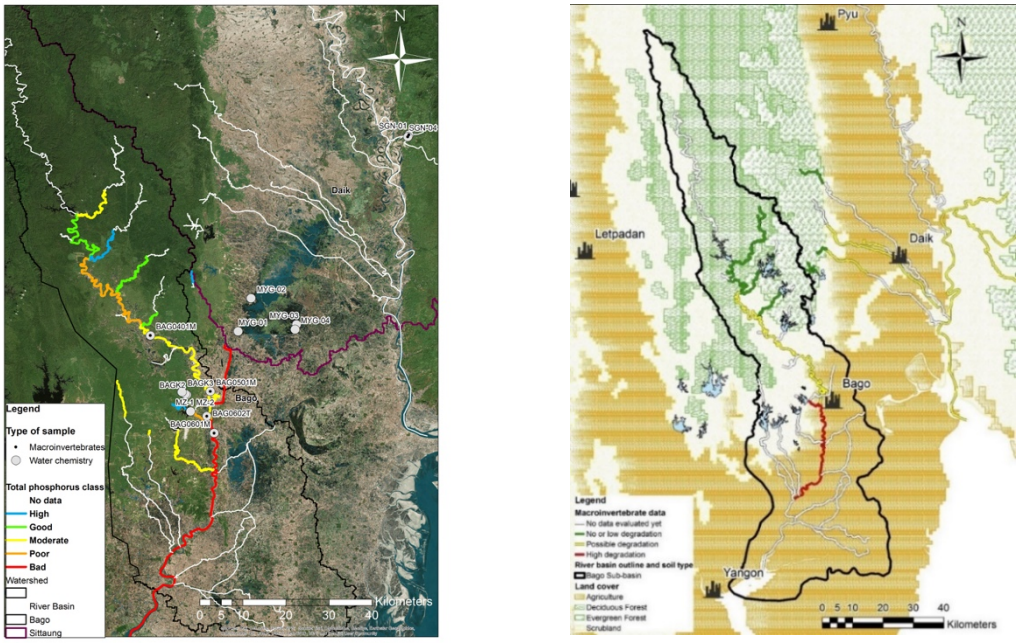


Figure 8. *Right side*: Assessment of ecological status based on the physicochemical water quality element (T.E. Eriksen, 2018). *Left*: Qualitative assessment of streams of the Bago-Sittaung river basin based on macroinvertebrates. (T.E. Eriksen, 2018).

5.2.3 The main pressures: prioritizing among water management issues

The basis for the decision-making issue of prioritizing water management issues in the catchment is the identified pressures and water bodies at risk of not meeting the environmental objectives. . It needs to be emphasised that deciding how and what environmental objectives that should be the focus of management is also a political issue. Deciding among the water management issues to be prioritized is closely linked to a program of measures, and therefore also to sectors' willingness and ability of putting aside financial and other resources to implement measures.

According to the EUWFD, the prioritization among water management issues should be undertaken according to a risk approach. This includes a gap analysis of water bodies and factors to identifying the water bodies mostly at risk of not meeting environmental objectives. The UNESCO IWRM guideline approach place emphasises on the necessity for political will, and a need-based approach, and less emphasis on a risk approach with regard to the "need approach" it is emphasised the importance of embracing the public and stakeholders. Prioritizing among management issues as part of implementing the EU WFD in Europe, is often a result of a blending of prioritizing water management issues related to risks of not meeting good ecological status of water bodies, and political will.

The project approach on prioritizing issues

Pressures and prioritized water management issues were discussed in the Bago River Sub-basin Area Committee, and in the Non-governmental Stakeholder Group. It was decided to focus the pilot within the Bago River Sub-basin- the catchment which to a large degree covers the townships of, Bago, Waw, Thanatphin and Kawa. Discussions mainly covered pressures identified for these four case study townships.

The Committee and the Non-governmental stakeholder Group discussed pressures and prioritized water management issues in September 2016 and November 2016 at the Shwe War Tun hotel in Bago. The meetings were initiated with a PowerPoint presentation, which included a recent update of the ecological status in Bago water bodies based on monitoring of water chemistry and biology (invertebrates), and also information on the overall aim of the IWRM principles and approach. The purpose of these presentations was to facilitate for a common understanding of the situation. Largely the Committee and the Group identified the same issues to be prioritized. The project facilitators did not impose any rules to restrict the number of prioritized issues. Table 1 represent a combination of issues identified by the committee and the group.

Table 1. Meeting for the discussion of prioritized management issues in Bago (November, 2016).

Bago township	Thanatpin township	Kawa township	Waw township
Sewage Garbage Sand mining Industrial waste River Bank Erosion and Sedimentation	Salt water intrusion Invasive shell species destroying paddy fields High concentration of phosphorus and nitrogen Groundwater pollution Riverbank Erosion and Sedimentation	Salt water intrusion Invasive shell species destroying paddy fields High concentration of phosphorus and nitrogen Riverbank Erosion and Sedimentation	Salt water intrusion Invasive shell species destroying paddy fields High concentration of phosphorus and nitrogen Riverbank Erosion and Sedimentation

5.2.4 Specification of environmental aims and objectives

The overall environmental aim for river basin management according to the EU WFD is good ecological status of waters. The WFD sets out to protect fresh water, surface water, water ways, ground water, brackish water, transitional and coastal water a nautical mile off land. Other IWRM frameworks, such as the UNESCO framework rather focus broader on sustainable development aims (UNESCO, 2009). Related to sustainable development aims, the Sustainable Development Goals (SDG 2015) is a relevant reference framework. The SDG are the global goals supported by the United Nations (UNDP, 2015). The Myanmar National Water Framework Directive (MNWFD) identifies what are Myanmar long term environmental objectives; Good status for all ground waters and surface waters; and "Clean and sufficiently stored for all ground water and surface water (rivers*, lakes, transitional waters, and coastal waters) in Myanmar*". Furthermore, several national environmental strategies and objectives have been adopted in Myanmar the recent years, and we see this as important information related to identification of local environmental objectives.

The Bago Sub-Basin Area Committee needs to define environmental objectives for all water body categories which have been classified as not reaching the defined environmental objective of the NWFD. It may not be possible to reach the target objective of NWFD for certain water bodies during the present planning period. There may therefore be delays in reaching the overall objective. For these water bodies, a realistic objective needs to be decided upon. The action point of setting environmental objectives in each water body which does not reach the targeted objective of the NWFD needs to be debated and interest groups and civil society consulted. It needs to be underlined, that coordination of the policies of the various sectors is a prerequisite for reaching the environmental goals. It should furthermore be emphasised that establishing and interpreting the environmental goals is in itself a political process, where the overarching goals need to be coordinated with feasible targets and available means for reaching these. Identified environmental aims, need to reflect the decided prioritized management issues. The environmental objectives refer to aims which can be addressed and achievements monitored. An annual follow up of progress towards environmental objectives is advised. This should include a progress report, is based on sufficient monitoring, to assess the degree that abatement measures improve surface water quality.

The project approach to environmental objectives
The framework presented reflects the reference made to the objectives of good chemical and biological status of the EU WFD and of the Myanmar NWFD (Appendix A). The framework being discussed by the Committee and the Group, includes an overall long-term sustainable development goal, "Safeguarding living oceans, rivers and lakes for the benefit, safety and enjoyment of present and future generations", an overall aim which reflects the Sustainable Development Goals (Figure 9). The sustainable development goal is formulated holistically and overarching. It may be discussed whether this overall goal should be the same as that of the Wetland Policy; or that of the National Water Policy.

Discussion of environmental objectives was discussed by the Committee in November 2016 and by the Group in March 2017. It was suggested that good ecological status in the Myanmar context, refers to the five environmental objectives: no eutrophication; water bodies free of contaminants, healthy rivers, lakes and streams, sufficient water flow, and no soil erosion. Ecological quality criteria are being developed for Myanmar conditions for chemical and biological water quality elements (Workshops in November 2017; discussion of invertebrates as indicator species for ecological status assessment in rivers at the International Business Centre in Yangon, and macrophytes and phytoplankton as indicators of ecological status assessment of lakes and reservoirs at FD in Taunggyi.

Identification of short-term environmental objectives is recommended. However, the identification of short-term objectives was not aimed for in this pilot, as such discussions needed experience-based knowledge of impact of measures from Myanmar. The alternative to discussing short term objectives, is the discussion of realistic abatement measures for implementation.

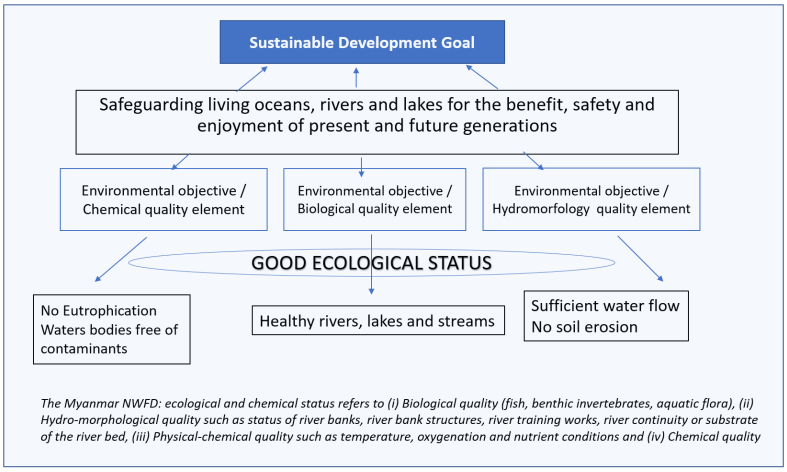


Figure 9. Illustrates how the sustainable development goals with sub-objectives links to the specific objectives of the Myanmar NWFD.

5.2.5 The Programme of Measures

The Programme of Measures (PoM) is an overview of prioritized measures in a river basin; actions identified for implementation during the current planning period for reaching the decided environmental goals.

A compilation of measures currently implemented for reaching environmental aims represents a first approach to identifying a programme of measures. The compiled overview of measures can be achieved by requesting each member department to provide a list of measures being implemented. This overview of implemented measures should include, an assessment of the effectiveness of measures, the measure incentive, and funding mechanisms. The Non-governmental Stakeholder Group should have the possibility to discuss and provide feedback to the list of implemented measures.

The overview of measures, in combination with knowledge on environmental pressures and risks of not meeting environmental aims in water bodies, represent the baseline for discussing potential measures for the coming period. Measures should be specified for township level, and possibly where relevant also for the river stretch level. Regarding water quality control, a combined or dual approach to water quality management is recommended (EU WFD). This encompasses the use of chemical quality standards for water bodies, and the use of emission limit values for any discharge of effluents to them, i.e. source control. The dual approach has been adopted because source control alone may not prevent a cumulative pollution load where there are several sources of pollution. Measures may take the form of a requirement for prior regulation, such as a prohibition on the entry of pollutants into water, prior authorization or registration based on general binding rules such as permits, licences or concessions. Analysis of the most cost-effective set of measures, and evaluation of whether costs are disproportionate meaning that costs are disproportionate if they are too high related to anticipated effects of the measure are recommended. The programme of measures should

be made publicly available. The results of a possible consultation may be presented in a separate chapter of the report.

The project approach on identifying the programme of measures
The Bago Sub-basin Area Committee discussed possible abatement measures in a meeting on March 3rd, 2017 and the Non-governmental Stakeholder Group discussed possible abatement measures on June 19th 2017. Discussions were supported by a common understanding of pressures and ecological status enabled by presentations prepared by FD, IWUMD and NIVA on water quality monitoring results from the Bago Sub-basin. Discussion groups were asked to discuss and identify possible measures to target pressures for reaching the environmental objectives. To ease the discussion of abatement measures, we introduced the concept of water body groups, that is water bodies were grouped according to; (i) *water use criteria*, (ii) *types of pressures,* and (iii) *the distance in status from reaching environmental aims.* In total five water body groups were identified in the Bago Sub-basin;

- Upstream Bago City Area water bodies (low environmental pressure)
- Bago City Area water bodies (pressures mainly from sewage and waste)
- Downstream Bago City Area water bodies (pressures from agriculture, fertilizers and pesticides, and sewage and waste)
- Reservoirs and dam water bodies (water bodies used for irrigation and drinking water)
- National parks and wetlands protected for biodiversity

Measures identified mainly referred to control and regulation types of measures. The need to increase local awareness was repeatedly emphasized as an important measure, and in particular by the Non-Governmental Stakeholder. No economic measures were suggested. Some suggested "measures" had character of an aim. Discussions of possible measures in the sub-basin in the Committee and in the Group, did not detail how, or where in the basin measures could be implemented. Measures identified in the Bago District are mostly rules and regulation type of measures (described below).

Prioritization of measures in the project: The process of prioritizing abatement measures in Bago included two main steps, the first step involved discussion in the Bago Sub-basin Area Committee on June 16th and by the Non-governmental Stakeholder Group on November 10th, 2017, while the second step included bilateral discussions with sector authorities, and with Bago Region parliament members for further feedback. The purpose of this was as far as possible to suggest and involve sector authorities in deciding upon what would be realistic abatement measures.

The principle of cost-effectiveness was an important principle for discussions, but funding possibilities, and political and social will to implement measures were decisive factors. It was emphasized that awareness raising for both government staff and for civil society are critical for prioritization of measures. At the Committee and the Group meetings, members were asked to discuss the following criteria for prioritization:

1. Where; 2. When, Costs, (low moderate high), 3. Socially acceptable, 4. Politically acceptable, 5. In line with climate change mitigation objectives, and Identify responsible institution.

The Bago Forest Department as the head secretary has subsequently interviewed sector authorities to collect information about ongoing abatement measures in the Sub-basin. This also involved an assessment of the effectiveness of measures. A final meeting with representatives from the Committee

and the secretaries of the Bago Sub-basin Area Non-Governmental Stakeholder Group were organized to agree on the final Programme of Measures.

5.3 Reflections on the project pilot

This chapter has presented the procedures of the practical water management tasks, and the decision-making issues for developing the sub-basin management plan. Central related issues in this pilot have been; data production and collation, access to the same data, trust building, social learning, involvement of local level authorities, and non-governmental stakeholders, institutional building and a pragmatic and flexible process for reaching the overall aims of the pilot. The many objectives of this pilot have influenced the scope and the depth of some of the analyses undertaken in the pilot, such as for instance the scope of the socioeconomic data collection and analysis. The testing of more formalized methods for prioritizing among proposed measures, such as a thorough cost effectiveness analysis, which may in principle be relevant in Myanmar has not been the ambition of pilot. Yet, as the data required for these methods often are largely unavailable, such methods are often also inappropriate. The pilot has rather emphasised an approach which was not too demanding with regard to collection of data and data analyses, while still facilitating for a knowledge based, transparent and coordinated approach. We, the authors recognize that this pilot represent social learning also for the project team, hence the pilot has not attempted to take on the heavier challenges; the selected sub-basin can be characterized by few conflicts, and the pilot has not aimed to target discussions of trade-offs among sector and environmental policy goals. Rather when prioritizing among measures the project team has emphasized the broader socio-environmental win-win perspective; political and social acceptability, and funding options. In the continuation of the approach, however, there is a need to challenge issues where trade-offs among environmental and policy aims are needed. This may in particular be related to environmental aims and, (i) industrial development and the lack of waste water treatment facilities, and (ii) fertilizers and pesticides of agriculture. Such trade-offs require an increased institutional interplay and support not only on district and regional level, but also often on national level authorities. Another issue which needs focus in a river basin management follow up, is how to target participation and involvement of non-governmental stakeholders in a situation of different ethnic groups; how to facilitate for representative participation, and that the different ethnic and marginalized groups have the capacity and knowledge to contribute to the process.

In the Bago Sub-basin Area environmental pressures mostly refers to waste, sewage, but also to run off from agriculture. Upstream in the sub-basin water quality is less impacted. It is water bodies in the dense settlement areas which are most at risk of not meeting the environmental goals. In this pilot we have experienced that the Township Development Committee which has responsibility for garbage and sewage in the urban areas has an important role in the Committee for identifying pressures and appropriate measures for reaching environmental aims, in addition to the WMD FD, IWUMD, DWIR, and ECD. The Township Development Committees by including elected representatives also has had an important possibility to facilitate for local anchoring of approaches and the process. The need to increase local awareness was repeatedly emphasized by all actors in the pilot.

Finally, we want to state that the achievements related to the aims of an increased awareness and understanding of the river basin strategy, a coordinated, knowledge based and produced by transparent decision making has been supported by iterative approach, and a repetition of the issues to be discussed; and we emphasise in this regard also the interest and engagement of local actors in Bago, without this situation few achievements would be possible.

6 Final remarks

This report has presented the procedures, and the learning experience gained as part of implementing the pilot river basin approach in the Bago River Sub-basin. Together with the reports: *A proposal for an administrative set up of river basin management in the Sittuang River Basin;* the *Characterization of the Bago Sub-basin, pilot implementing the EU Water Framework Directive;* the *Environmental objectives and abatement measures for a healthy Bago River*; and the *Bago Sub-basin Management Plan*, this report completes the documentation of the river basin management approach implemented as part of the IWRM project in Bago. While the above-mentioned reports present topic related approaches for river basin management, this report focuses on the experiences of implementing this management regime in Bago. Furthermore, reflections on considerations, and theories which has guided the implementation strategy are included. It is worthwhile to remember that IWMR is a general framework that requires case-specific adaptation for implementation in different settings (GWP, 2009). To respond to the uncertainty of socio-ecological systems, and to the varied institutional cultural, environmental, and economic factors, an adaptive management framework (Pahl-Wostl, 2002) has been an important strategy for this pilot.

The project team view the challenges of governance for sustainable development as partly territorial and partly administrative and political (Moss 2012). To accommodate this perspective, and to enable a close relationship with local authorities and actors, the pilot has been implemented in a rather small sub-basin with few conflicts. Furthermore, the main Bago sub-basin territory is located within the Bago District, hence the pilot has largely been working within the political administrative borders. An important project objective has been to improve the institutional interplay by focusing on a shared understanding of problems among actors, improve coordination and contribute to transparent decision-making. The approach has been to facilitate for collaborative governance between sector and environmental authorities, non-governmental stakeholders in Bago, and considering the multiple governance levels in Myanmar. The project team of FD, IWUMD and NIVA have been facilitators for implementing this river basin pilot in Bago. This has involved a mediating role of explaining the purpose and the rational of the approach, and of ensuring that the perspectives of the different sector departments, scientific experts, policy makers and societal groups and public interests are presented and considered. It has been an objective to work towards a common understanding of the situation; and to contribute with a framework for systematic water management where decisions are made based on *best available knowledge,* and where several interests are included and have a say in how decision are taken.

In line with the adaptive management strategy, we highlight that we see this pilot as an early stage of implementing the river basin management approach in Myanmar. Furthermore, the inherent procedures of coordination, access to information, knowledge-based decision making, involvement of non-governmental stakeholder and transparent decision making, these are all aspects which requires continuous improvement and attention. Processes which create greater coherence among policies, and which helps to reduce redundancy and contradiction within and between polices. This pilot has focused on coordination within a sub-basin, however, subsequent projects need to focus on how to accommodate coordination between Sub-basins Areas to create a holistic River Basin Area Management Plan.

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Appendix A. Terms of reference Committee

Introduction: The Myanmar National Water Framework Directive (NWFD) specifies the goal of river basin management in Myanmar by implementing and developing River Basin Area Water Management Plans.
The IWRM project (a collaboration between the Forest Department, MONREC and NIVA in Norway) is pilot implementing the sub-basin management in the Bago Sub-basin. As part of this project, two institutions have been established in Bago, a Bago Sub-basin Committee which consists of sector and environmental authorities, and a Bago Sub-basin Non-governmental Stakeholder Group. The Committee is responsible for the development of a holistic Sub-basin Water Management Plan. The development of this plan is based on several decision-making steps, including;

(i) deciding upon main pressures, that is deciding upon prioritized water management issues,
(ii) deciding upon short term environmental goals, and
(iii) deciding upon abatement measures for implementation

The process of developing this plan shall involve feedback and input from Non-governmental Stakeholder Group related to each of the above decision making steps.

Terms of Reference for the Bago Sub-basin Area Committee

Mandate of the Chair and Responsibilities of Secretaries of the Committee were confirmed and agreed by the parties June 2018. The TOR has been discussed in bilateral meetings with the chair and the secretaries in 2017. The secretaries of the Bago Non-governmental Stakeholder Group have commented on draft versions of the TOR.

a) The Sub-basin Area Committee (hereafter the Committee) shall include all relevant sector and environmental authorities within the Sub-Basin Area, this refers to such as, water related regional level departments, Hluttaw regional level, and Township Development Committees shall get invitations to meetings, including agenda and background information.

b) The Committee shall include as the minimum three elected secretaries, one head secretary and co-secretaries. The elected secretaries need to be institutions with a core role regarding the use or management of water resources.
   (1) In the Bago Sub-Basin Area Committee, the FD is the main secretary and the IWUMD, and the DWIR are co-secretaries. ECD, and the Township Development Committee will be co-secretaries from 2019.

b) The Committee shall include one chair person. In the Bago Sub-Basin Area Committee, the Bago Ministry of Natural Resources, Forests and Environmental Conservation (MONRFEC) Minister is elected to be the chair.

c) The Committee has responsibility for ensuring coordination of practical water management tasks, that is a cost efficient and effective monitoring program in the sub-basin, specific institutional monitoring (sampling, analysis, and interpretation of samples) and making data available (access to database).

f) The committee has responsibility for the development of a holistic river basin management plan. The plan shall include information on the following topics:

   (1) A description of water users, water usage, specification of economic uses, description of pressures in the Sub-basin.
   (2) Data on water quality and quantity and a risk assessment of not reaching the environmental objectives.
   (3) Description of monitoring efforts; location of sampling stations, and the parameters analyzed.
   (4) A table of prioritized programme of measures. The table should as far as possible have information on (i) costs of measures, timeline, where in the sub-basin the measure will be implemented, the expected effectiveness of the measures relative to the pressure and the environmental objective, timeline, incentive / enforcement, and funding.
   (5) A description of the process of developing the plan, including the steps and approaches for involvement of Non-governmental Stakeholders in the Sub-basin.

(g) Approval of the Sub-basin Management Plan: The river basin management plan when completed shall be sent to the NWRC for approval.

h) The water management cycle, with reference to the National Water Framework Directive, refers to a ten-year cycle, therefore the Sub-basin Management Plan need to and the plan shall be updated every fifth year.

(i) Committee meeting frequencies: During development of the plan, the Committee need to meet as a minimum three times a year – to discuss, - coordination of practical water management tasks, and - decision making with reference to the water management cycle (1. characterization, 2. prioritized water management issues (pressures), programme of measures and prioritized programme of measures). During the phase of implementing measures, the Committee should meet at the minimum two times a year to discuss progress, and possible adjustments on agreed mitigation measures.

(i) Relationship to other committees and institutions: Information about the intention to develop the Sub-basin management plan, the time table of the development, and important milestones of developing the plan should be passed on to other relevant committees in the (environmental and climate change committee) region – district – townships. Information needs to be forwarded to the Hluttaw regional level.

(j) Support for the Non-governmental Stakeholder Group, including budget; see the TOR of the NGS Group.

Mandate & Responsibility of the Chair

a) The chair has the overall responsibility for - that the secretaries perform according to their mandate

b) Overall responsibility for decision making in the committee

c) Overall responsibility for that the, Sub-Basin Area Management Plan is developed.

d) Overall responsibility for sending the Sub-Basin Area Management Plan to the NWRC. If *Basin Committee* exists being responsible for the development of a *Basin Plan* consisting of all the Sub-basin Area Plans, then it is the responsibility of the Basin Committee Chair to submit the Plan to the NWRC for approval. The Committee members are responsible for gaining accept of the plan by the Union level Department prior to sending the plan to the NWRC.

Responsibilities of Secretaries of the Committee

a) The secretaries are responsible for sending out invitations to Committee meetings according to the agreed work plan and timeline for developing the plan. Invitations need to be received at the minimum two weeks before the meeting. Invitations need to specify the agenda and the place for meetings.

b) The secretaries are responsible for suggesting the agenda of meetings to the Committee chair. After acceptance from the chair, invitations including the agenda can be sent to Committee members

c) Invitations shall be sent to all relevant sector and environmental authorities within the Sub-Basin Area.

d) The secretaries are responsible for preparing minutes – and for sending out minutes to Committee members.

e) Responsible for making available relevant known background information (including such as pressures, and data on water quality and quantity) to Committee members.

f) The secretaries are responsible for making sure that the Non-Governmental Stakeholder Group is well functioning – meaning that NGOs, CBOs, private and civil society - are as appropriate invited to meetings, and that two secretaries of the NGSG are invited to Committee meetings to ensure transparency.

g) A budget and additional human resources need to be made available to the institutions holding the main secretary. The budget also needs to cover necessary support for the Non-governmental Stakeholder Group; this may refer to such as printing expenses, or expenses related to sending invitations and rent of location for meetings. It is suggested that the regional government could support these activities.

Appendix B. Terms of reference the Non-governmental Stakeholder Group

Introduction: The Myanmar National Water Framework Directive (NWFD) specifies the goal of river basin management in Myanmar by implementing and developing River Basin Area Water Management Plans.
The IWRM project (a collaboration between the Forest Department, MONREC and NIVA in Norway) is pilot implementing the sub-basin management in the Bago Sub-basin. As part of this project, two institutions have been established in Bago, a Bago Sub-basin Committee which consists of sector and environmental authorities, and a Bago Sub-basin Non-governmental Stakeholder Group. The Committee is responsible for the development of a holistic Sub-basin Water Management Plan. The process of developing this plan shall involve feedback and input from Non-governmental Stakeholder Group related to each of the above decision making steps.
The development of this plan is based on several decision-making steps, including;

(i) deciding upon main pressures, that is deciding upon prioritized water management issues,
(ii) deciding upon short term environmental goals, and
(iii) deciding upon abatement measures for implementation

The Non-governmental Stakeholder Group is established to provide an arena for discussion of water issues, and specifically, the main decision making points needed to develop the Sub-basin Management Plan. It is the responsibility of the Committee Chair to establish a Non-governmental Stakeholder Group (hereafter the, Group) in the sub-basin. Once the Group is established, including support for election of secretaries, the Group itself needs to be responsible for its organization and administration. Possible members of the group are main NGOs, CBOs and main civil society actors on regional and sub-basin level.
The *Committee* is responsible for providing if needed, a location where the Group can meet, and budget to allow for printing of material, and sending invitation letters. The *Committee* shall prior to meetings make available the following information:

(i) information about the chemical and physical water quality data and the biological water quality data if this exists - preferably as part of access to the water quality database, or as part of information provided for by the Committee.
(ii) Information about current decision-making issues as discussed by the Committee, and a summary of the minutes.

Mandate and responsibilities of the Non-governmental Stakeholder Secretaries
Three elected secretaries are responsible for administrating the Group. The secretaries need to receive support for their continuous election from the other Group members every year. After three years, replacement of secretaries should be encouraged. Mandate and responsibilities were approved by the parties June 2018.

a) Invitations, and enabling involvement:
   a. The secretaries are responsible for sending invitation to members, to NGOs, CBOs, and civil society actors, including agenda for the meeting, at least two weeks before the meeting. The meeting should be organized in an easily accessible place. Invitations must be forwarded by the appropriate means.
   b. The secretaries are responsible for consideration of gender issues, by ensuring that, attendants at Group meetings also include women, and that gender issues when relevant are considered.
   c. The secretaries are responsible for ensuring the voice of marginal groups, by involving the, and ethnic groups; the secretaries are also responsible for being considerate of ethnic sensitive issues so as not to offend – or foster conflicts.
   d. The secretaries are responsible for providing for and enabling a Group discussion arena where all speeches are listen to and noted. This means that opinions are reflected in meeting minutes.

b) Information sharing and passing on information from Group discussions
   a. The secretaries are responsible for receiving information from the Committee, reading and passing

on the information to actors on Townships, and where relevant village level within the Sub-basin. Specific ward or tract administrations need to be informed in particular if, pressures, abatement measures discussed concerns the respective villages. The secretaries may delegate this task to other members in the Group, but the secretaries are responsible for that information from the Committee is forwarded to relevant actors.

b. At least two of the three secretaries are responsible for attending the Committee meetings based on invitations, preparing minutes, and passing on the minutes to Group members.
c. The secretaries are responsible for preparing minutes from Group meetings, which reflect the various viewpoints of members. Minutes should be disseminated to those attending the respective meeting for comments. Minutes needs to be sent to the Committee.

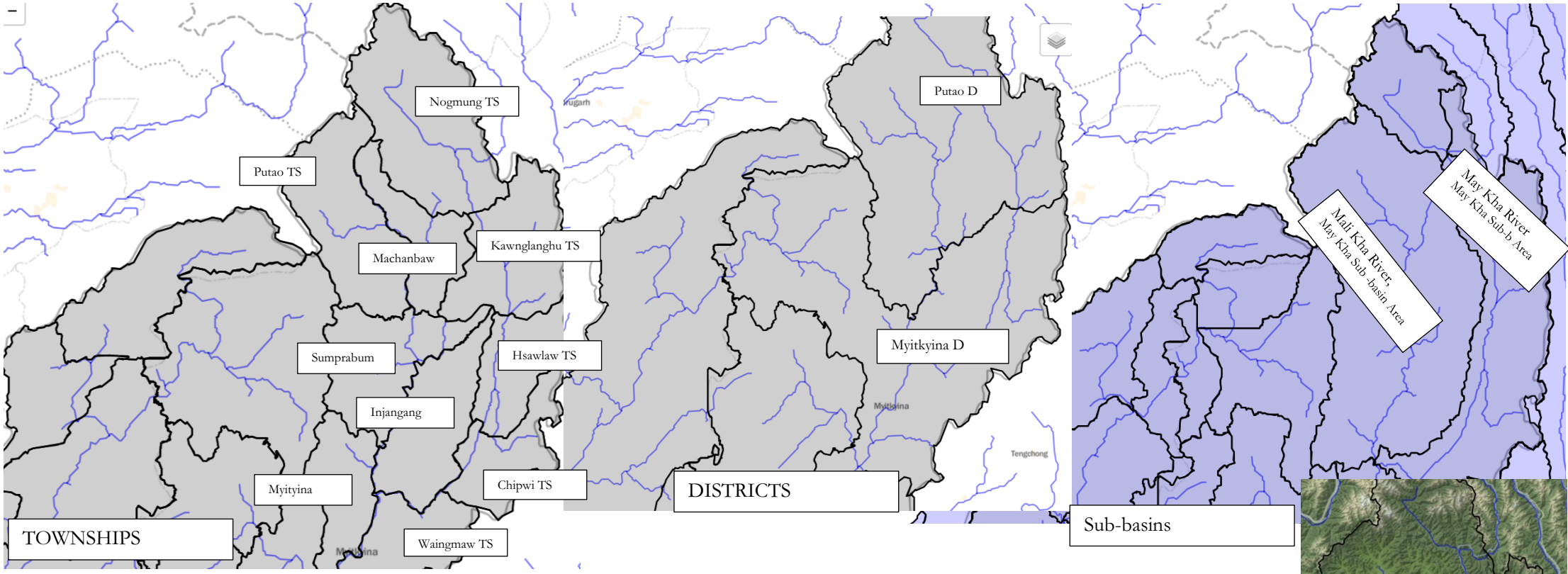
c) Conflicts

a. In the case of conflicts in the Group, the secretaries must negotiate to reduce conflicts. Different opinions among the Group however, is not problematic. Different opinions may be accounted for in the minutes which are passed on to the Committee.
b. In the case that conflicts appear to be non-negotiable, it is recommended to present the issue in a written format to the Chair, to seek assistance on how to solve conflicts.
c. In specific cases, where the conflict level is high, sub-groups may be established. As this is also matter of budget and resources, this need should be presented in a written letter to the chair. Such sub-groups, may also contact national level NGOs to present their issue and for support.

d) Elections

a. Election of secretaries should take place as soon as possible after the Group has been established. In the period before secretaries has been elected the Group can seek support for certain administrative assignments from the Committee.
b. The election needs to take place at a Group meeting. People may offer their service to be secretaries. If more than three people would like to take the position as secretaries, anonymous election should be arranged. Every year, the current secretaries need to receive support from the other members in the Group; this can occur as a simple statement in a meeting. If a current secretary lack support from the rest of the Group, or if a person currently acting as a secretary no longer wants to have this position, a formal letter to the Group needs to formulated describing the situation. If the Group cannot solve this situation, the Committee chair can be approached on the matter. The Committee chair, and its secretaries need to be informed if there is a change of Group secretaries.

Appendix C. Preliminary proposed Myanmar Sub-basin Areas



Northern Myanmar, Sub-basin number 1 and 2 on Myanmar map.

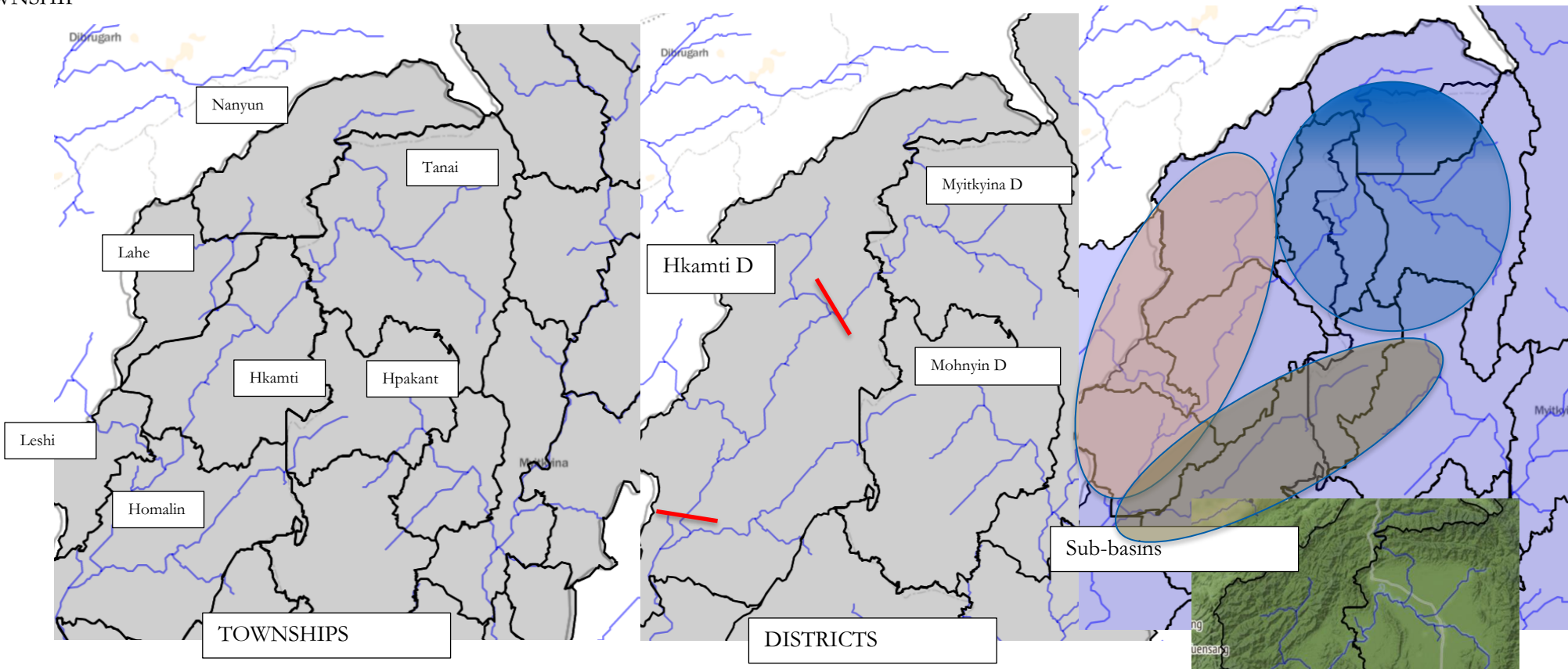
Left figure: show TS, Middle figure show Districts, Left figure show sub-basins

Suggestion:

May Kha Sub-basin Area (combine two sub-basin as pictured in the left figure above: District Putao, TS: NogMung / NawnGun, Kawnglnghu, District Myitkina: TS Hsawlaw, Chipwi, WingMaw

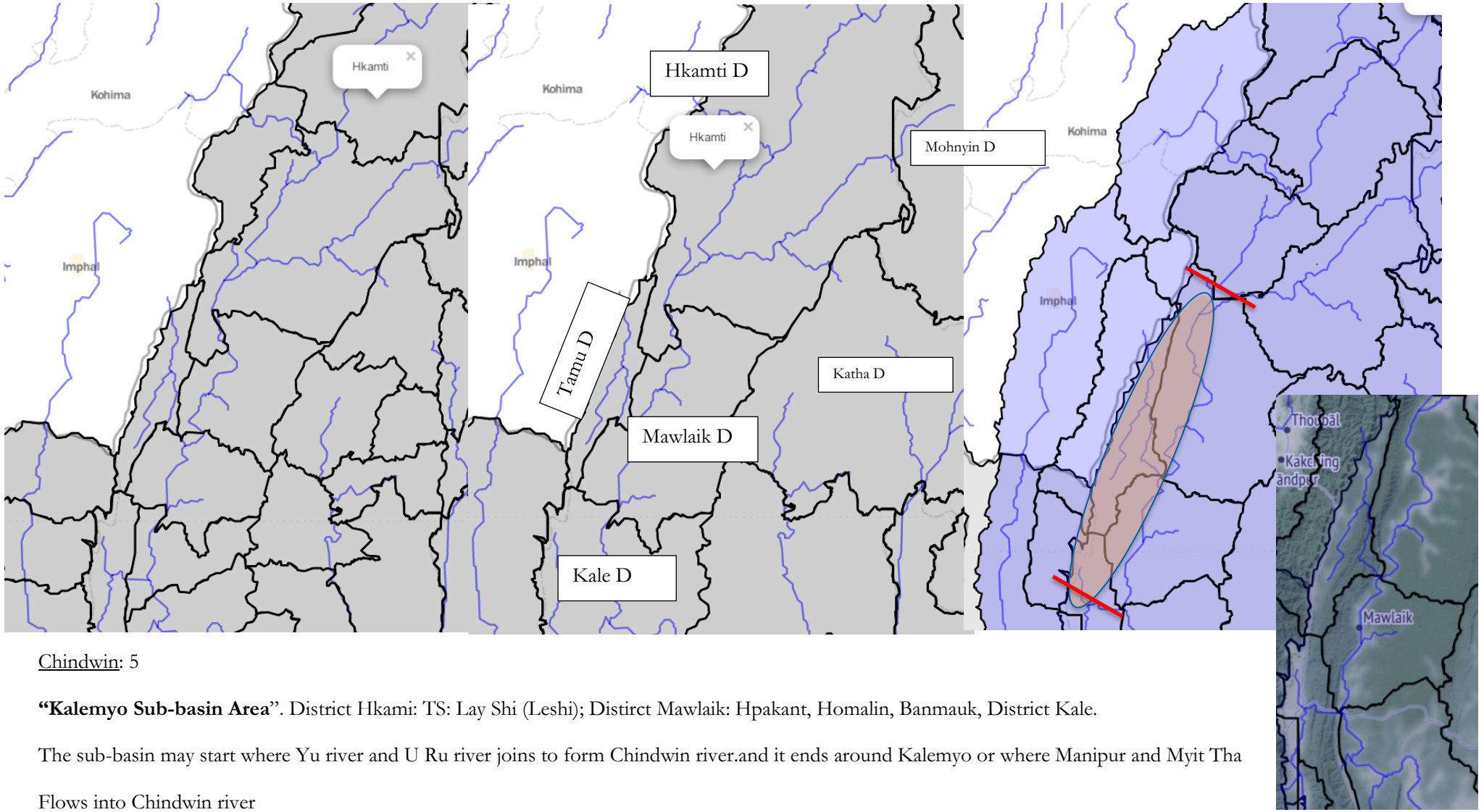
Mali Kha Sub-basin Area : District Putao: TS: Putao, Machanbaw, Sumprabum, District Myitkina: TS: Myitkina, Injangang.

TOWNSHIP



Uppermost Chindwin Sub-basin number 3 A, B and 4 on Myanmar map

"**Upper Yu Sub-basin Area**" - District Hkamti, TS Nanyun, and District Myitkyina, TS Tanai.
Lower Yu Sub-basin Area
"**U Ru Sub-basin Area"**: District Hkamti; TS Nanyun, Lahe, Hkami.

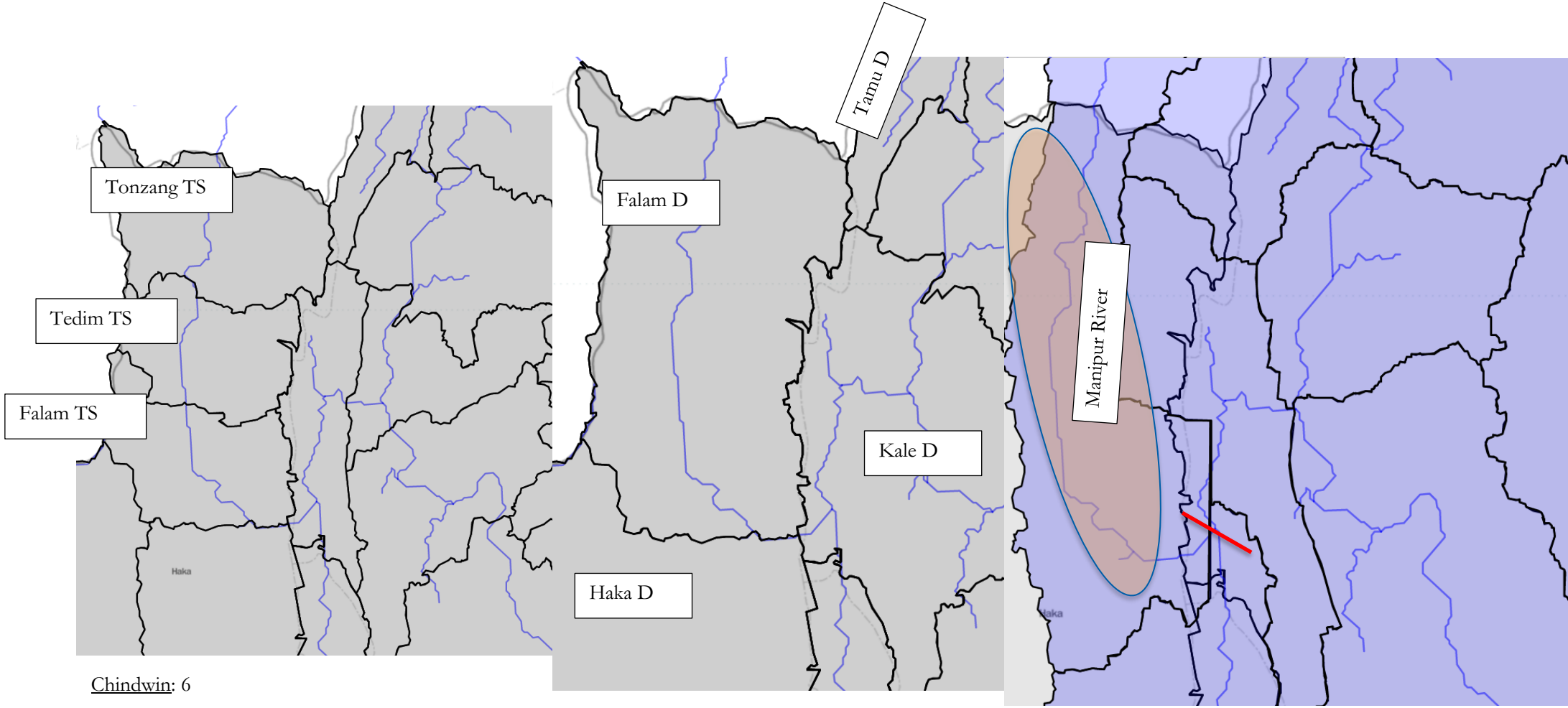


Chindwin: 5

"Kalemyo Sub-basin Area". District Hkami: TS: Lay Shi (Leshi); Distirct Mawlaik: Hpakant, Homalin, Banmauk, District Kale.

The sub-basin may start where Yu river and U Ru river joins to form Chindwin river.and it ends around Kalemyo or where Manipur and Myit Tha

Flows into Chindwin river

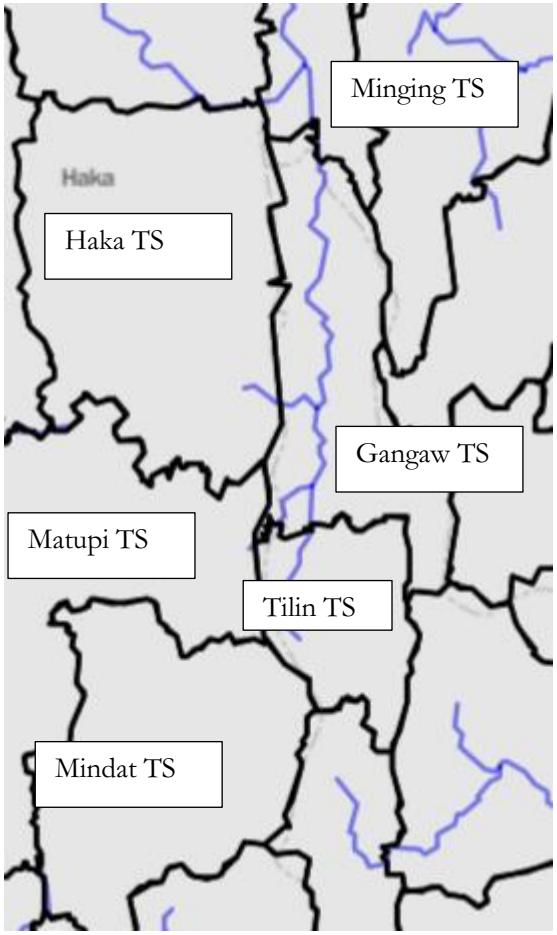


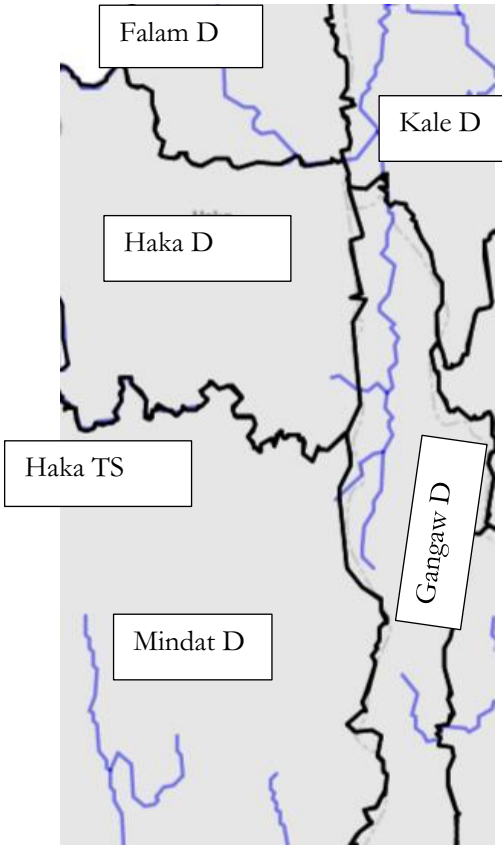
Chindwin: 6

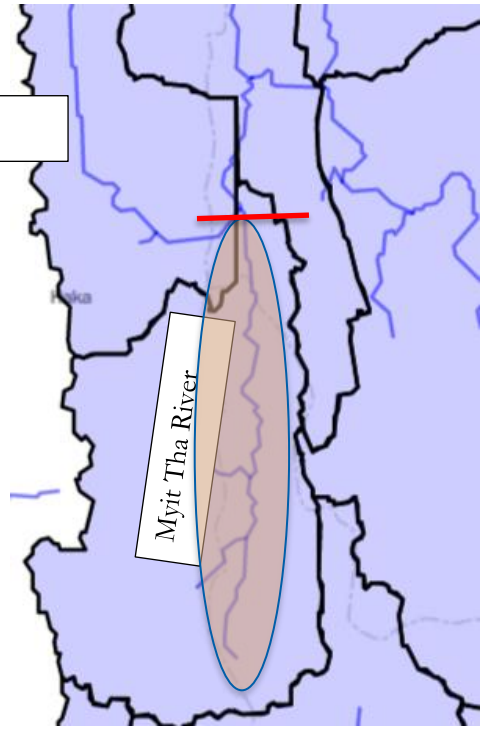
"Manipur Sub-basin Area" : District Falam: Tonzang TS, Tedim TS, Falam TS

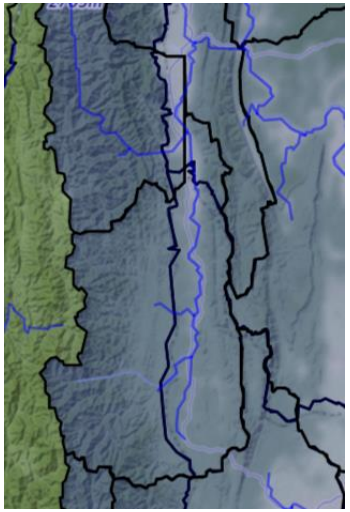
District Hakha: TS Haka

District Kale, TS Kale.



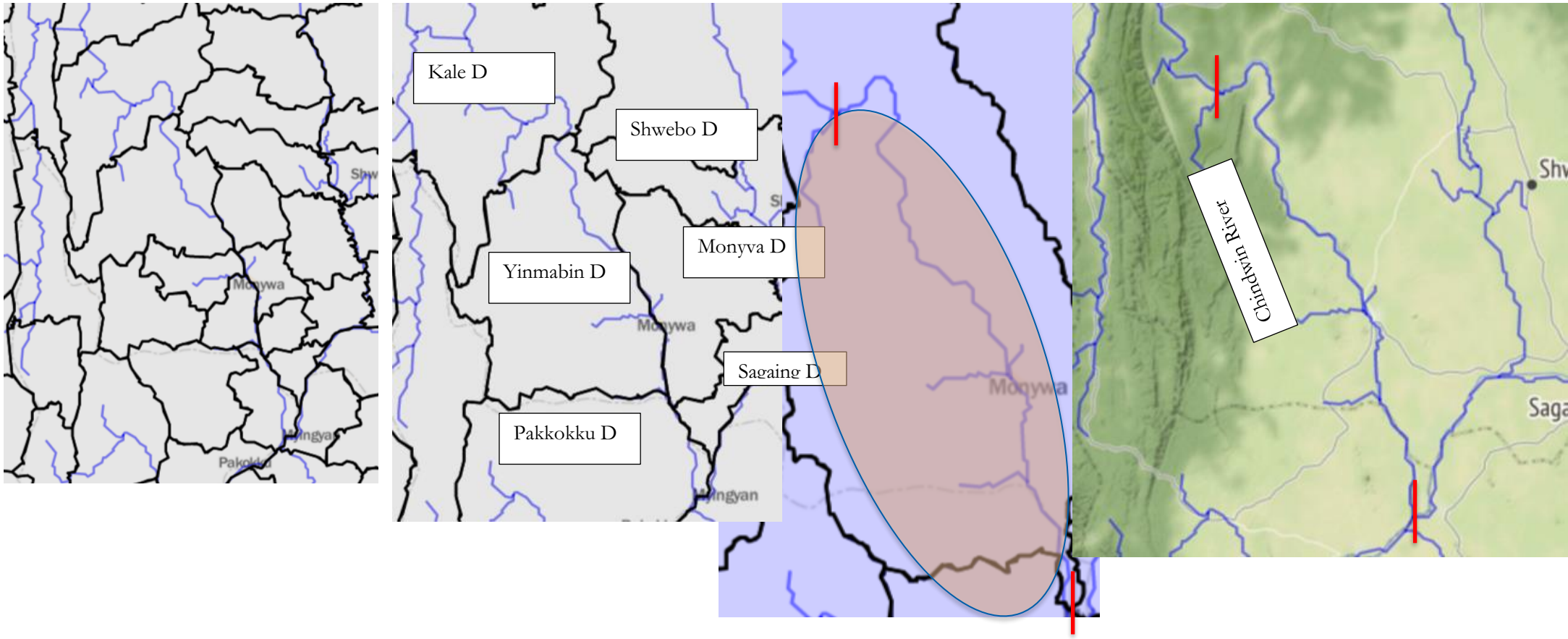






Myanmar Rivers 7

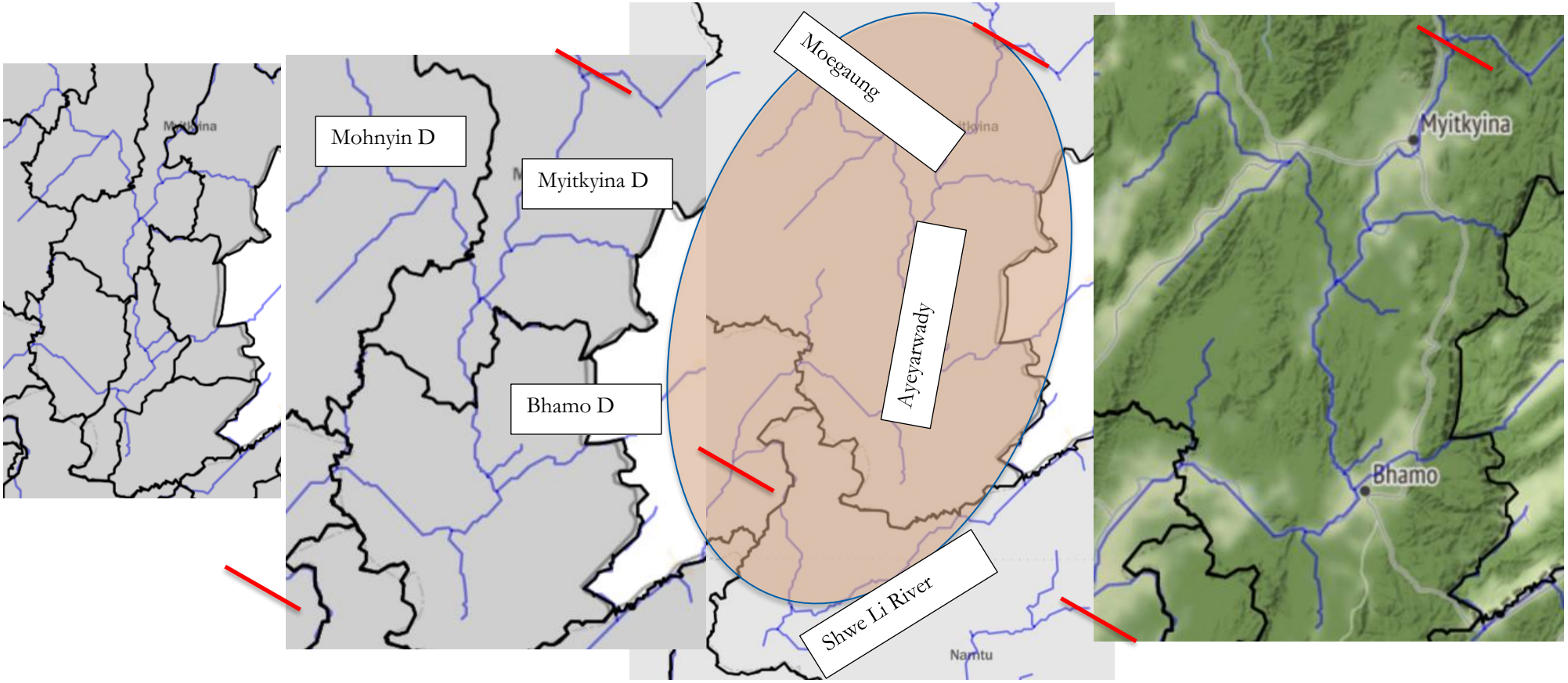
Myit Tha Sub-basin Area (it ends where Myi Tha River joins Chindwin River):
Kale D, Minging TS,
Gangaw D, Gangaw TS. Tiline TS
Hakah D, Hakah TS



River Basin Map 8

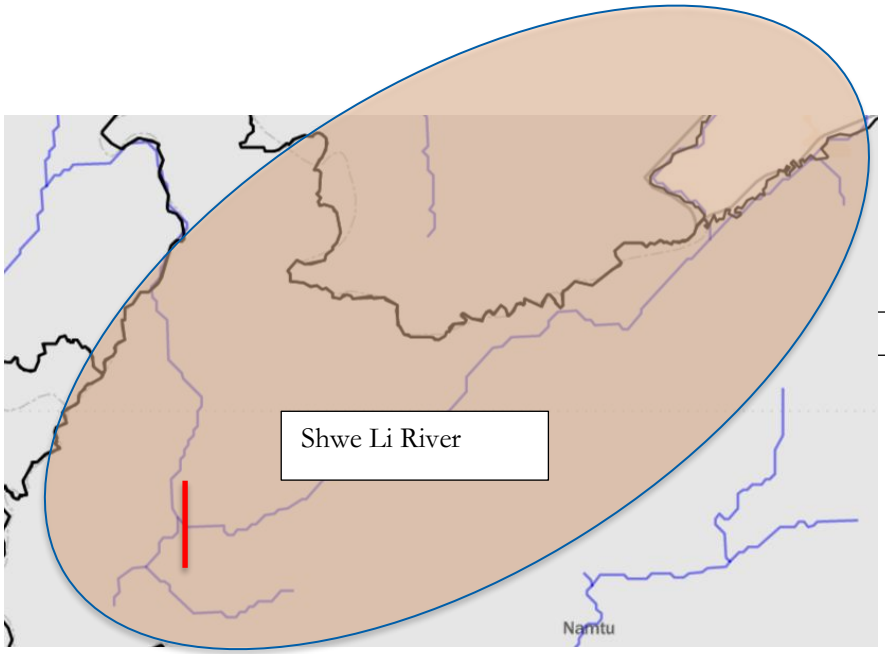
Lower Chindwin Sub-basin Area (it starts where Manipur and Myit Tha flows into Chindwin river and it ends where Chindwin flows into Ayeyarwady)

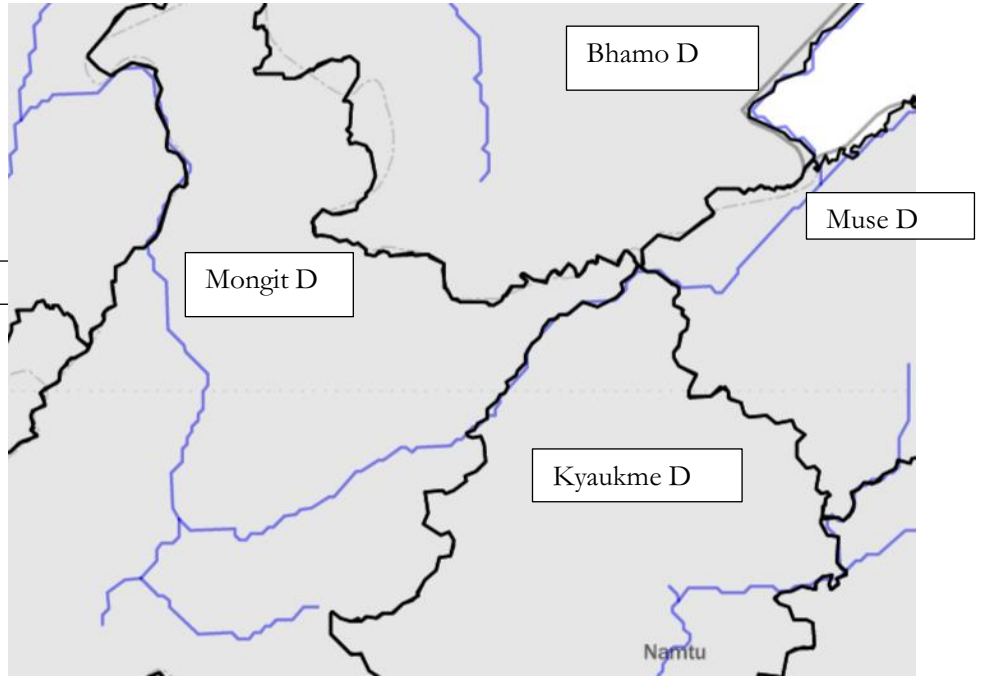
Kale D; Yinmabin D; Pakkokku D; Sagaing D



Myanmar River Maps no. 9 (upper part of Ayeyarwady)

Upper Katha Sub-basin area (the sub-basin starts where Mali Kha and May Kha combines to start Ayeyarwady, then it ends where Shwe Lie flows into Ayeyarwady.

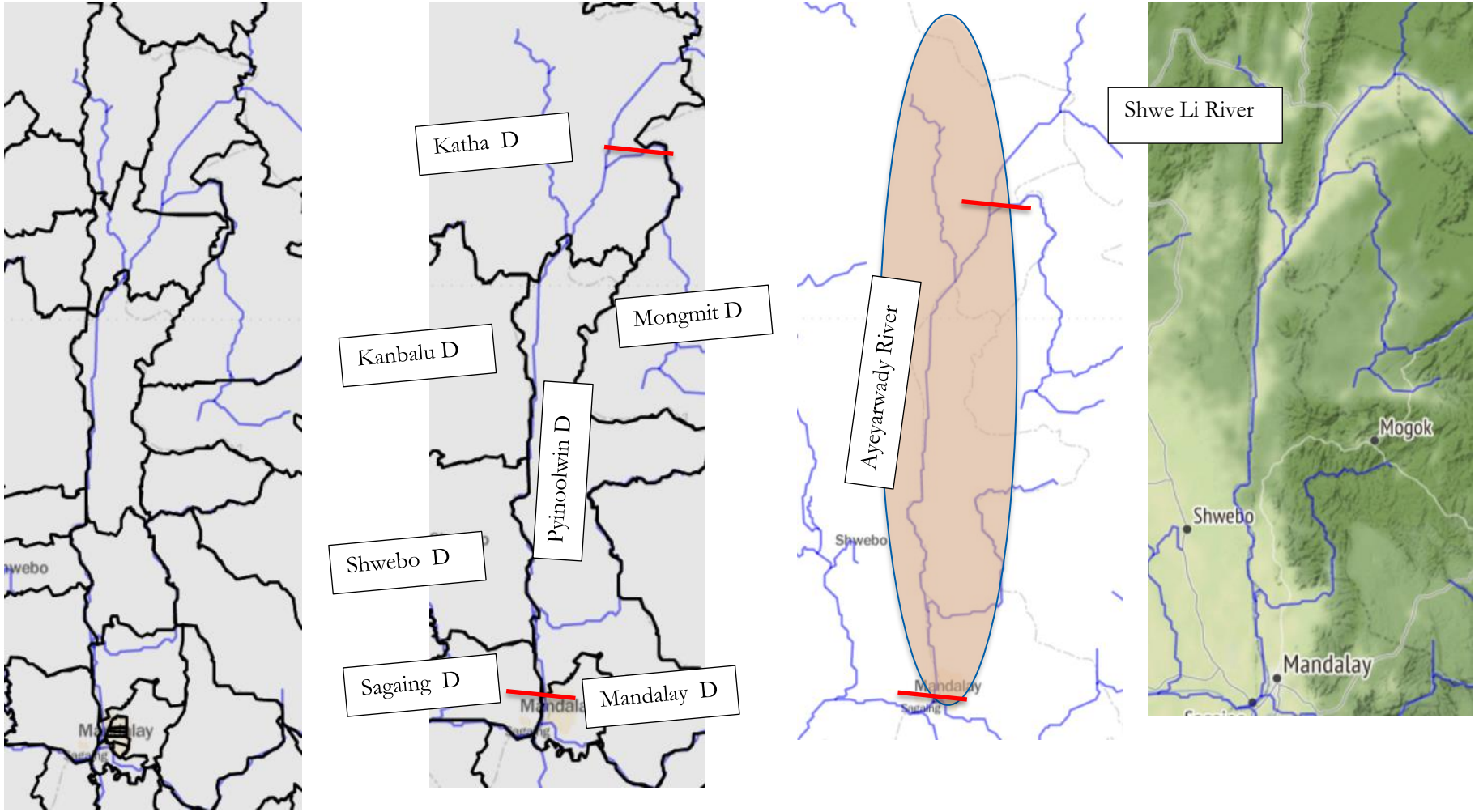




Myanmar River Map 10.

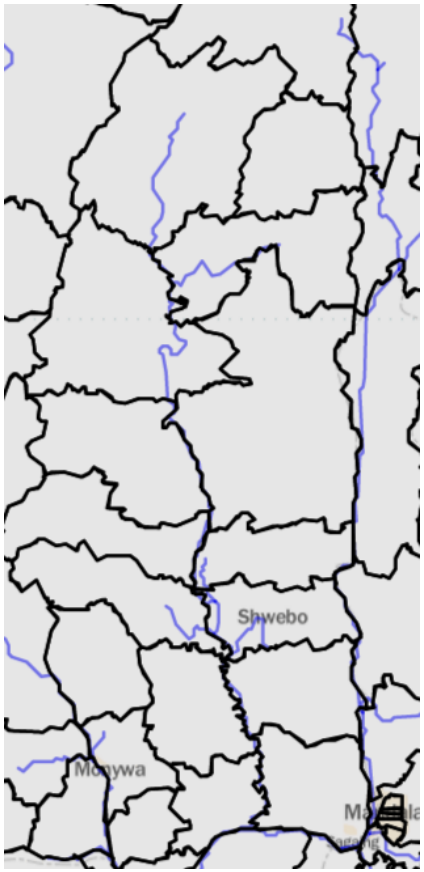
Shwe Li Sub-basin Area: it is an international basin starting in China where it is called ?? and it ends where Shwe Li river flows into Ayeyarwady.

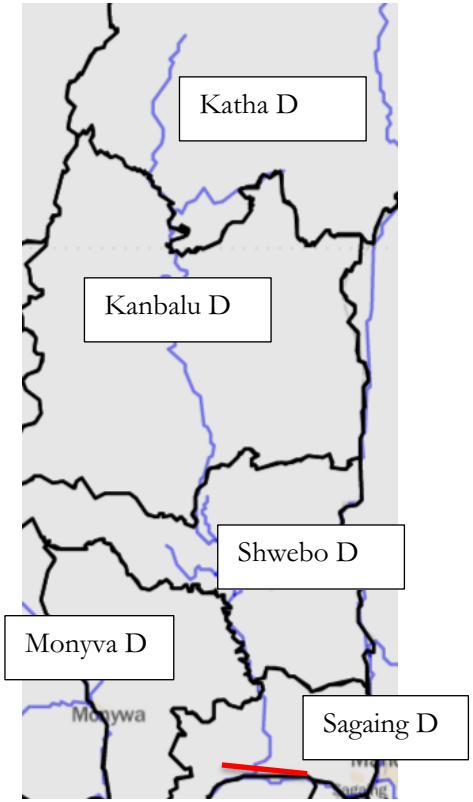
Bhamo D; Muse D. ; Kyaukme D; Mongit D

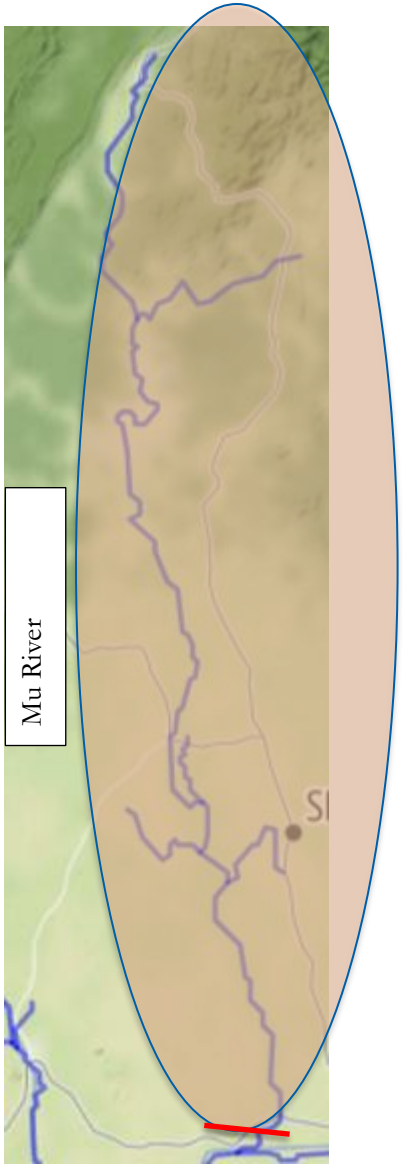


Sub-basin number 10 B.

Upper Mandalay Sub-basin Area It starts where Shwe Li River flows into Ayeyarwady and it ends at the start of Mandalay City. It includes two tributaries – but these may also be identified as separate sub-basin areas.



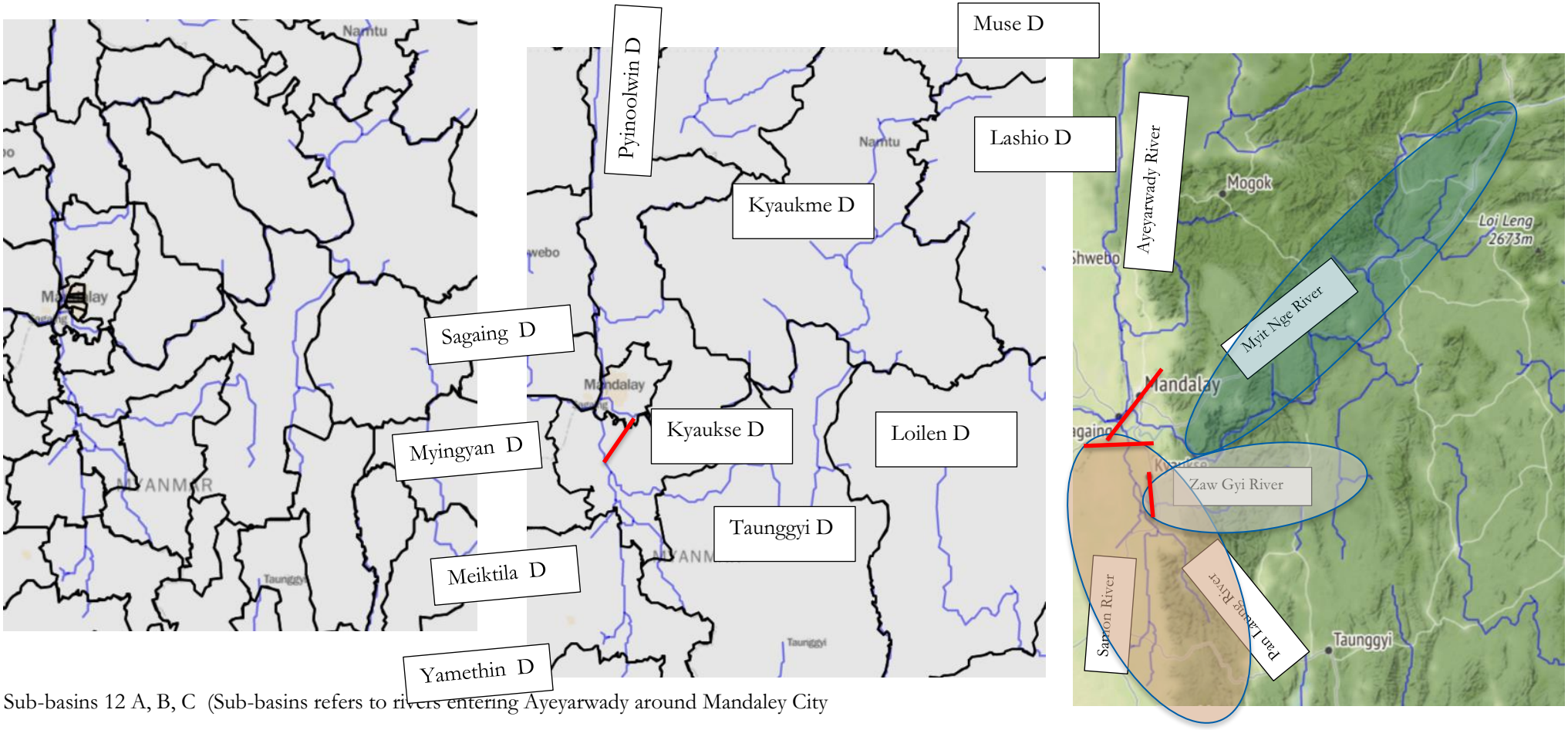




Myanmar River Maps 11

Mu Sub-basin Area – ends where Mu flows into Ayeyarwady – near **or just downstream Mandalay city**

It starts in Katha D, then flows into Kanbalu D, into Shwebo D, on the borderof Monyva D and into Sagaing D.

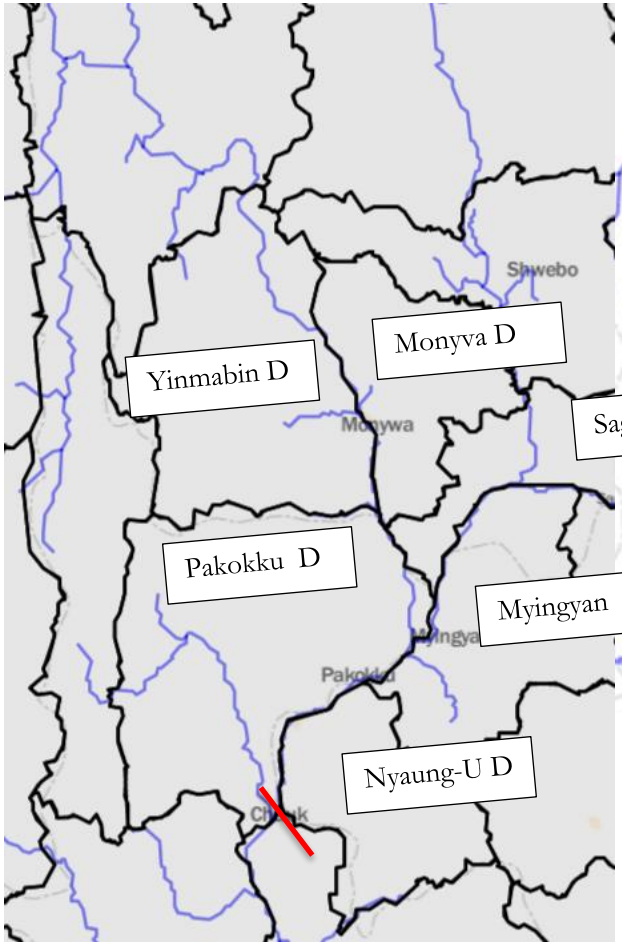


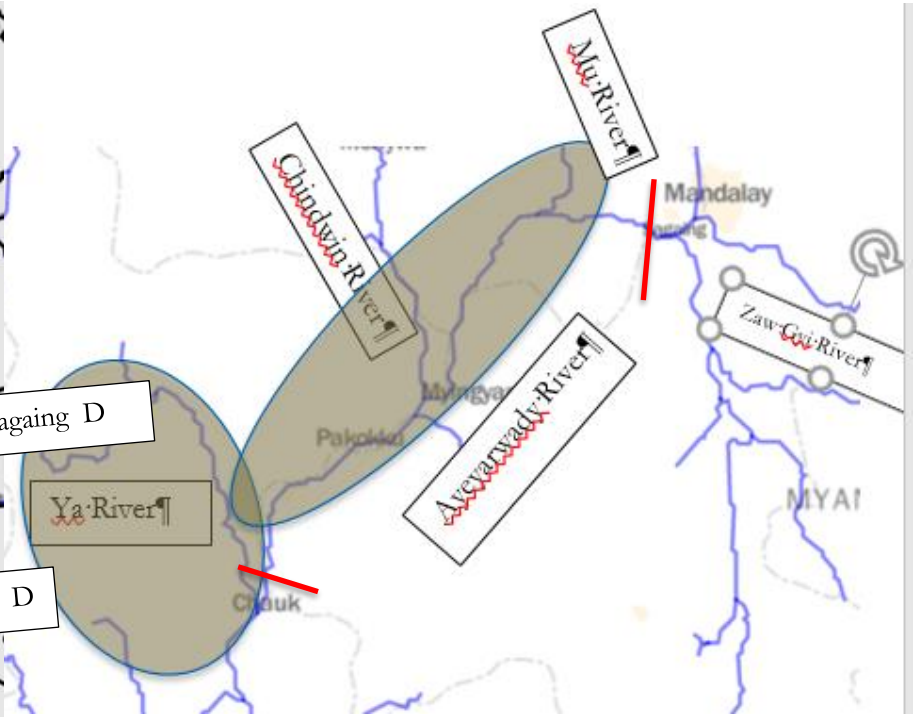
Sub-basins 12 A, B, C (Sub-basins refers to rivers entering Ayeyarwady around Mandaley City

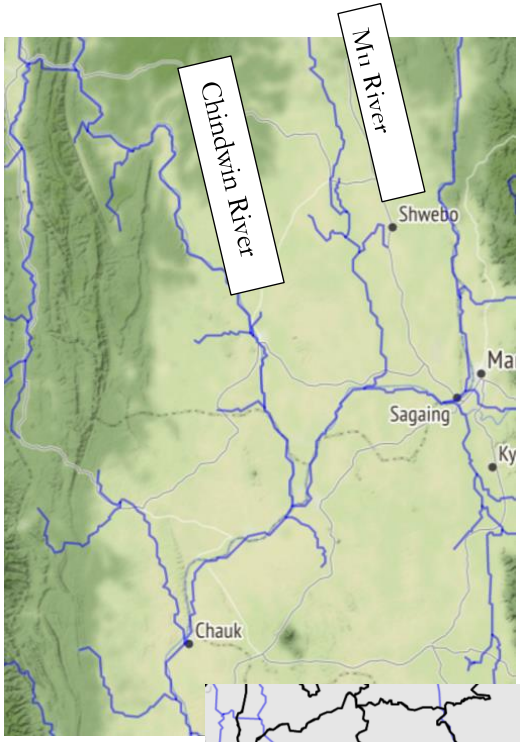
12 A Myit Nge Sub-basin Area ; the sub-basin area starts in the upper part of this catchment, the river in the upper parts are called Nam Tu river, further downstream it is called Myit Nge river – it ends at Mandalay city. It starts in Muse D, then into LashioD, then Kyaukme D, then a tributary from Taunggyi D, then Kyaukme D, Pyinoolwin D, Kyaukse D, and Mandalay D.

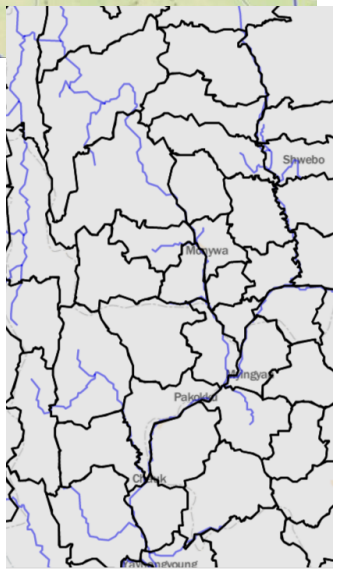
12 B Zaw Gyi Sub-basin Area (ends where Zaw Gyi river flows into Samon and Pan Laung rivers). It starts in Taunggyi D, then Kyaukse D

12 C Samon and Pan Laung Sub-basin area (ends where it flows into Ayeyarwady)It starts in Yamethin D, then Meiktila D, then Kyaukse D, and TuanggyiD



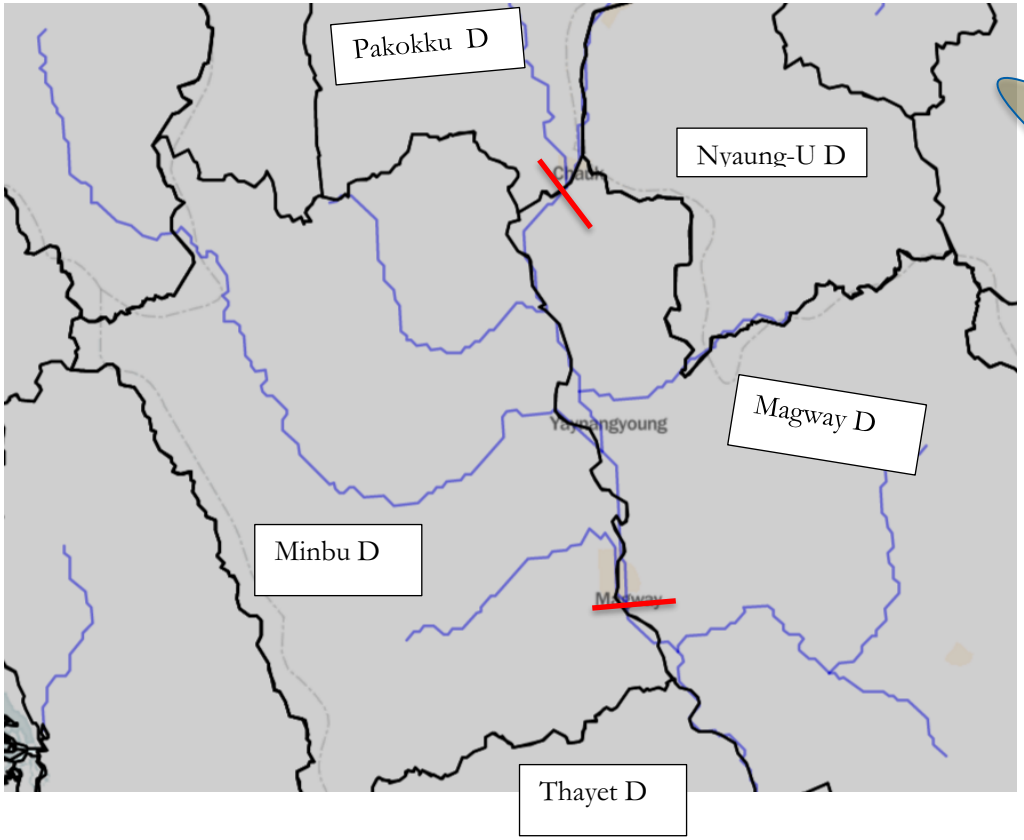


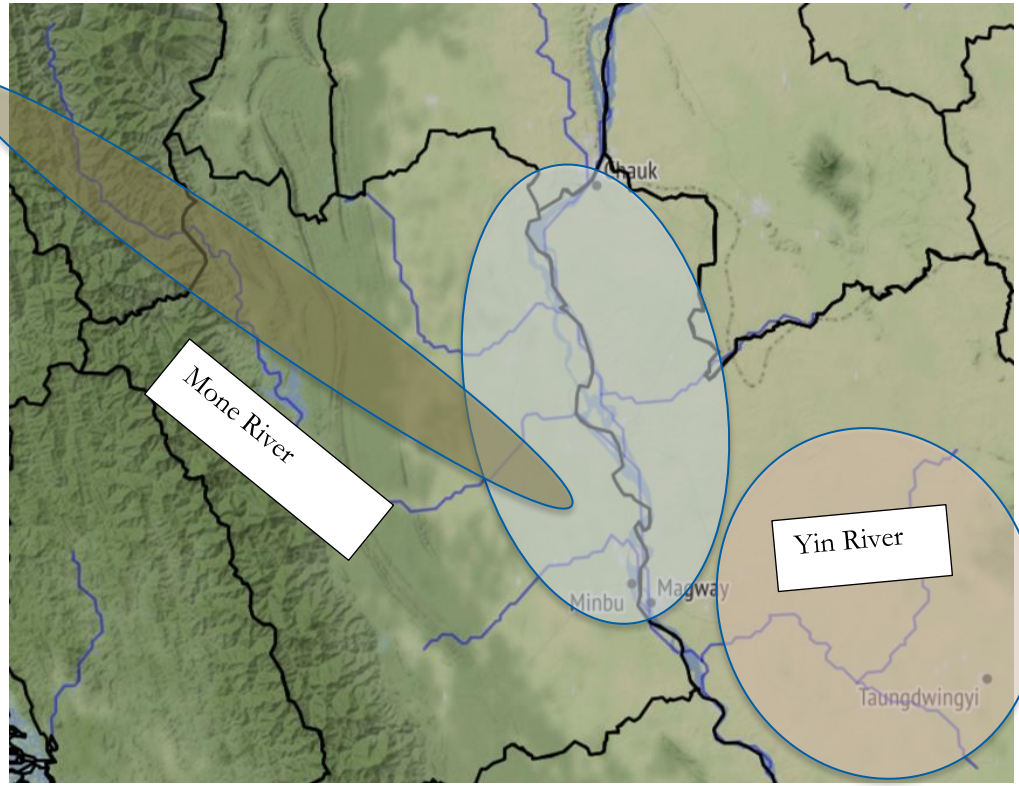




13. Ayeyarwady downstream Mandaley Sub-basin (it starts where Zaw Gyi River and Samon rivers flows into Ayeyarwady and it ends at Chauk city

14 **Ya River Sub-basin Area** – ends where Ya River runs into Ayeyarwady river

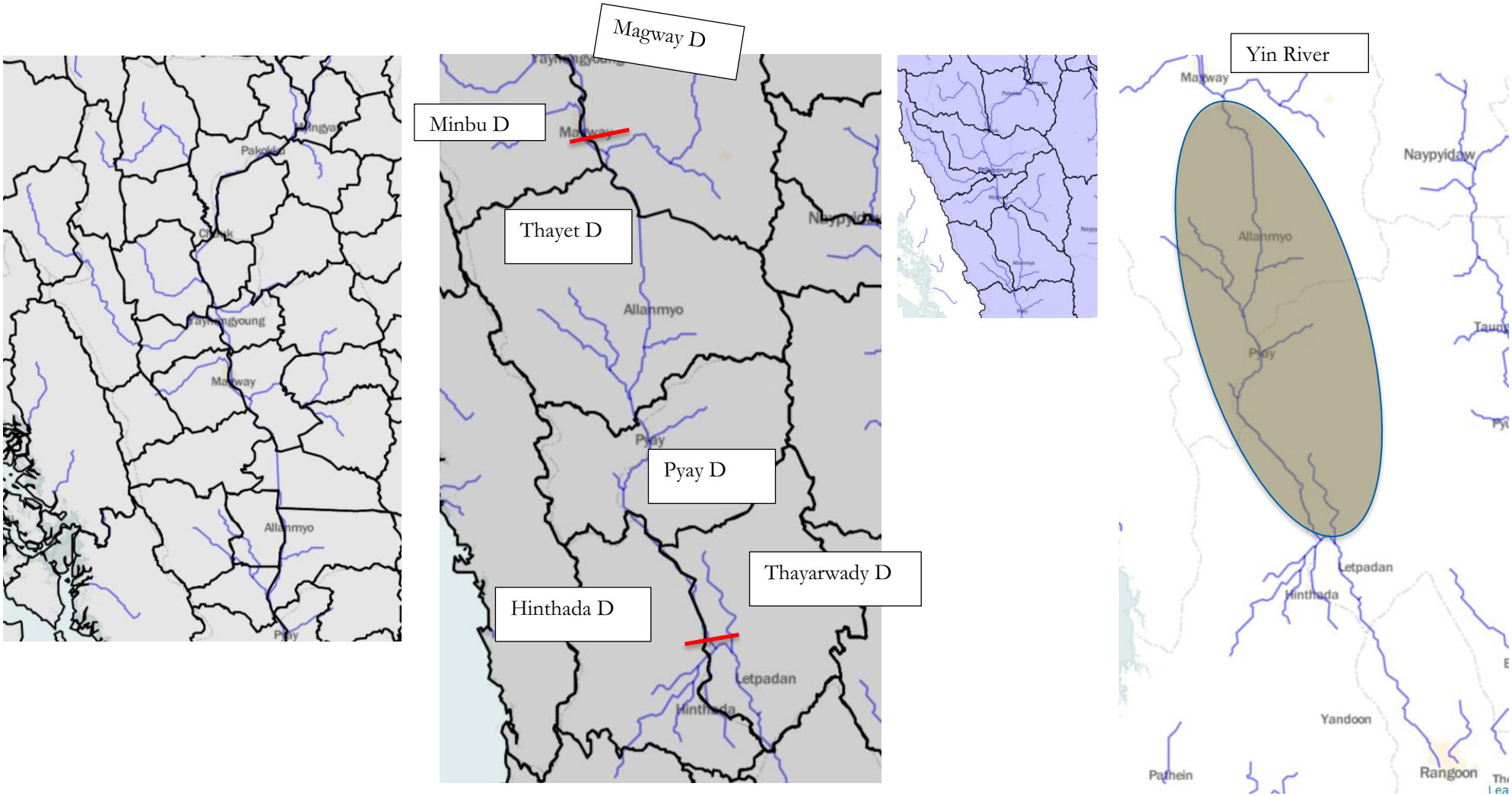




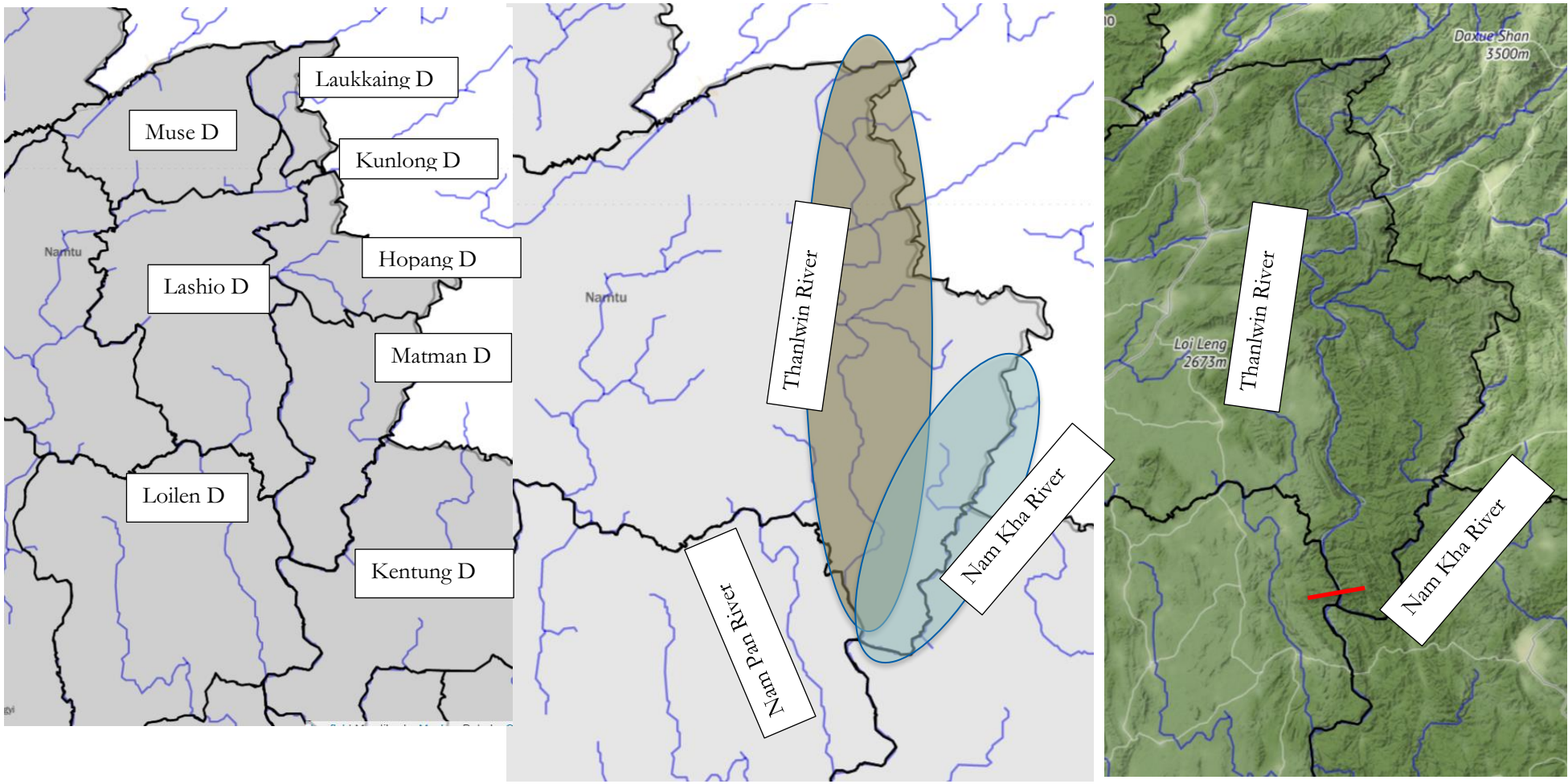
15. **Mone River Sub-basin Area**

16. **Yin River Sub-basin Area**

17 Lower Ayewarwady sub-basin Area (it starts at Chauk City (it could also start where Mone River flows into Ayeyarwady) and it ends at Magway (or the sub-basin area could continue down to Hinthada which is the start of the delta area. It includes a few tributaries, but two tributaries, the Mone River and Yin River are identified as separate sub-basins.

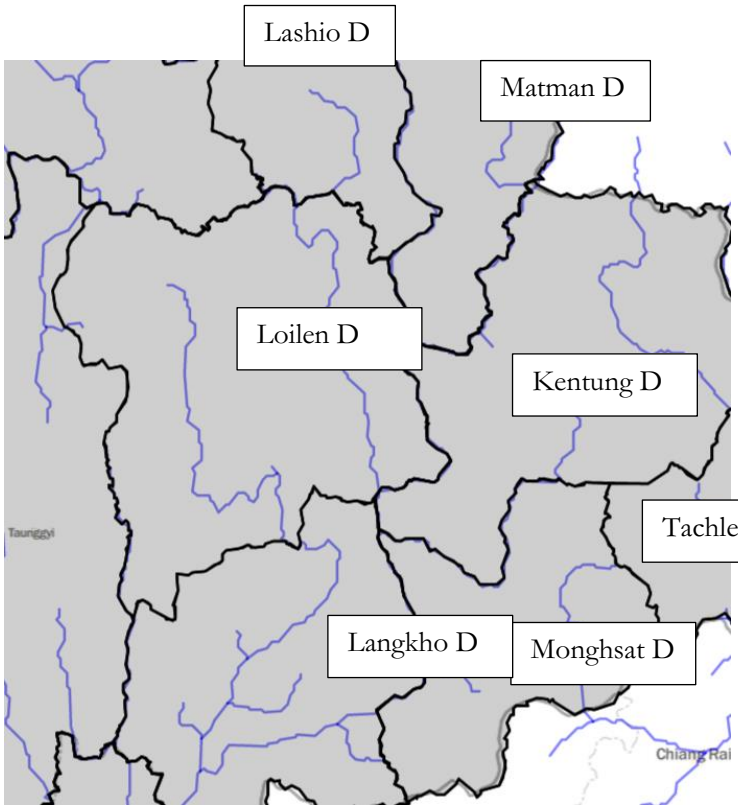


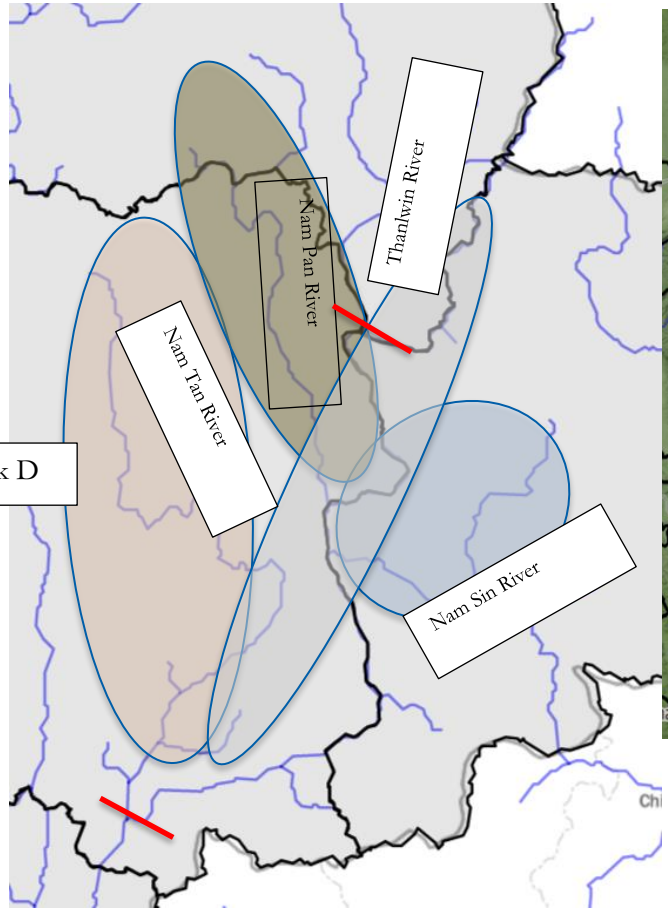
17 Lower Ayeyarwady Sub-basin It starts at Magway city and the District Magway, Minbu D, flows into Thayet D, then into Pyay D, then Hinthada D, og Thayarwady D.

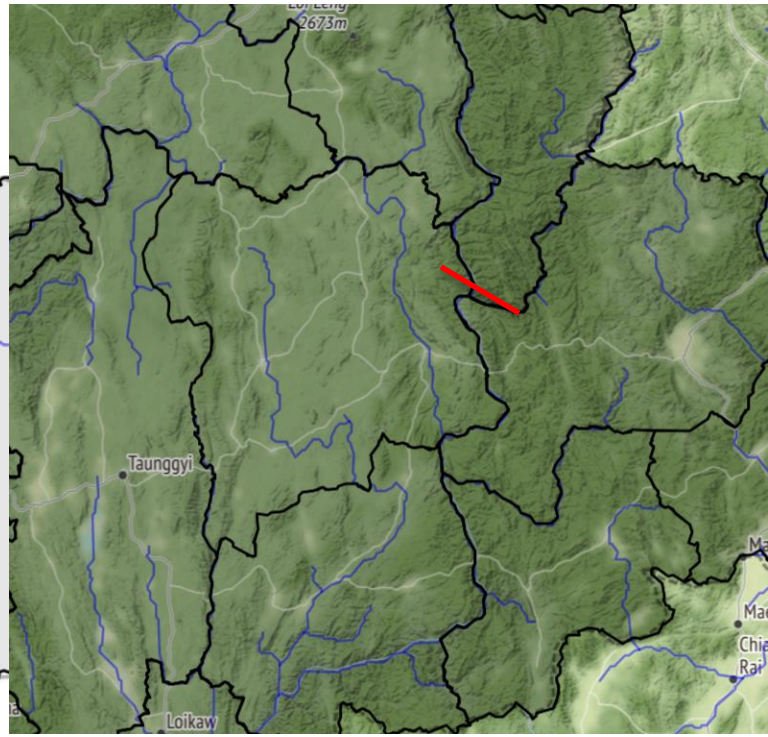


18. Upper Thanlwin Sub-basin Area (Suggest that it stops where Nam Kha flows into the river). It starts in China, flows into Laukkaing D, then Muse D., then Kunlong D, thn Hopang D., Lashio D, Matman D, and then Loilen D.

19 Nam Kha Sub-basin Area. It starts in China, then Matman D., then Kentung D., Loilen D.





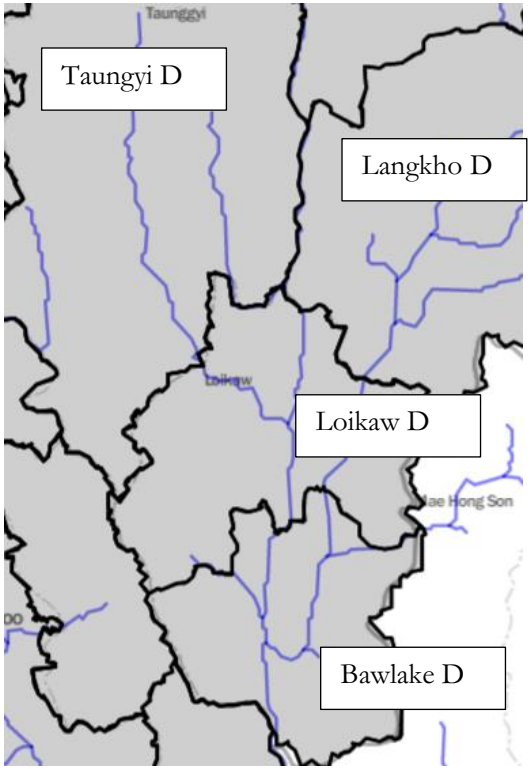


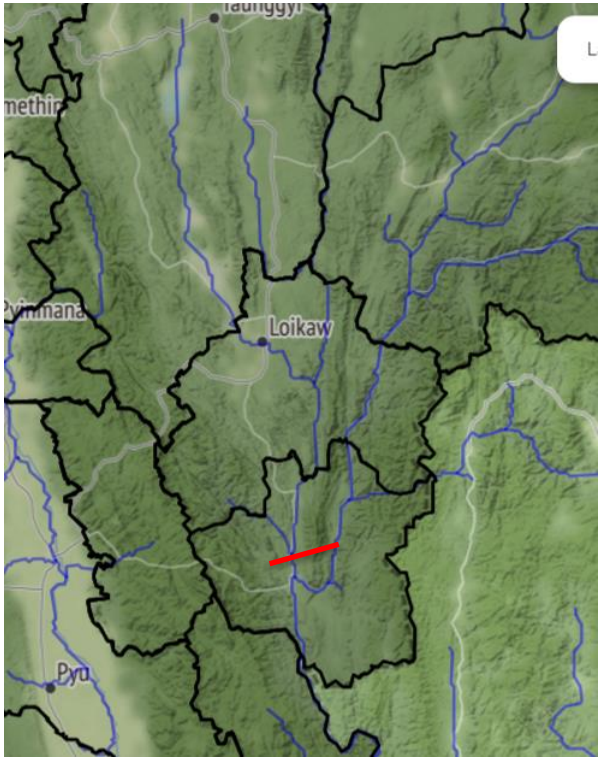
20. Nam Pan Sub-basin Area . It starts in Lashio D, flows into Loilen D, then Kentung D and Langkho D. where it flows into Thanlwin.

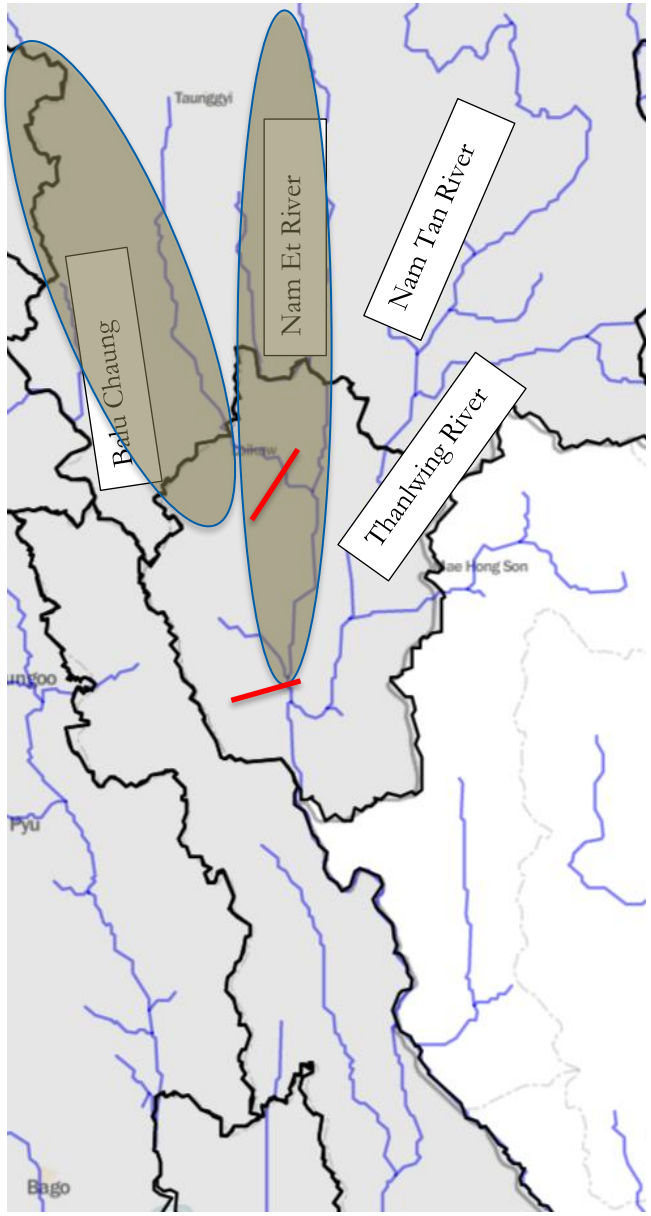
21. Thanlwin Sub-basin Area – starts where Nam Kha flows into Thanlwin and ends where Nam Tan enters. Kentung and Loilen D then Monghsat and Langkho

21 B. Nam Sin Sub-basin Area It starts in Kentung D and flows into Tachleik forming the border between the district Kentung and Tachleik stops at Thanlwin.

21 C Nam Tan Sub-basin Area It starts in Loilen D, and flows into Langkho D.and it ends where it flows into Thanlwin river

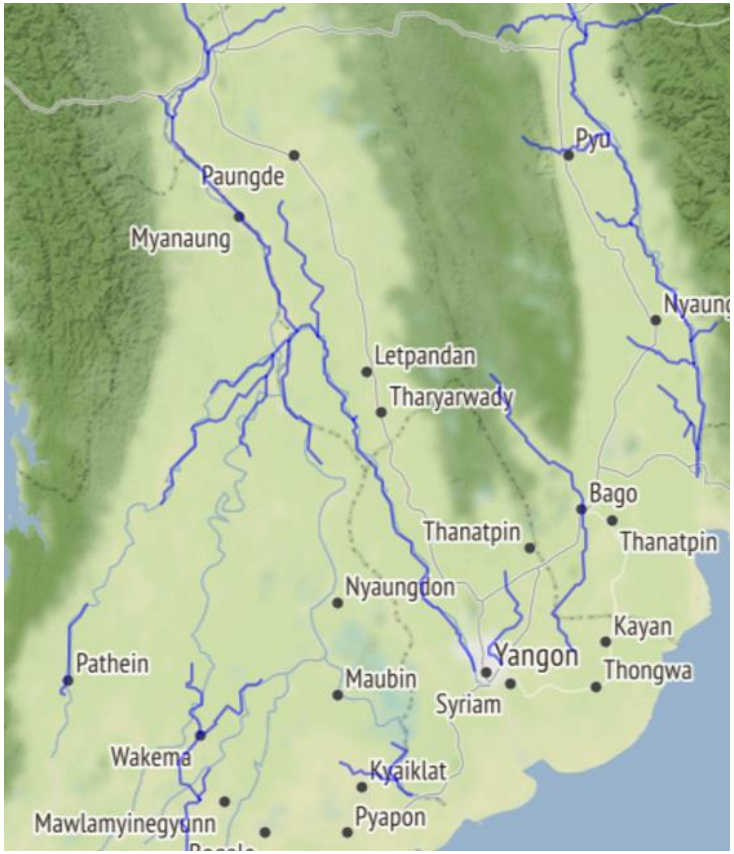




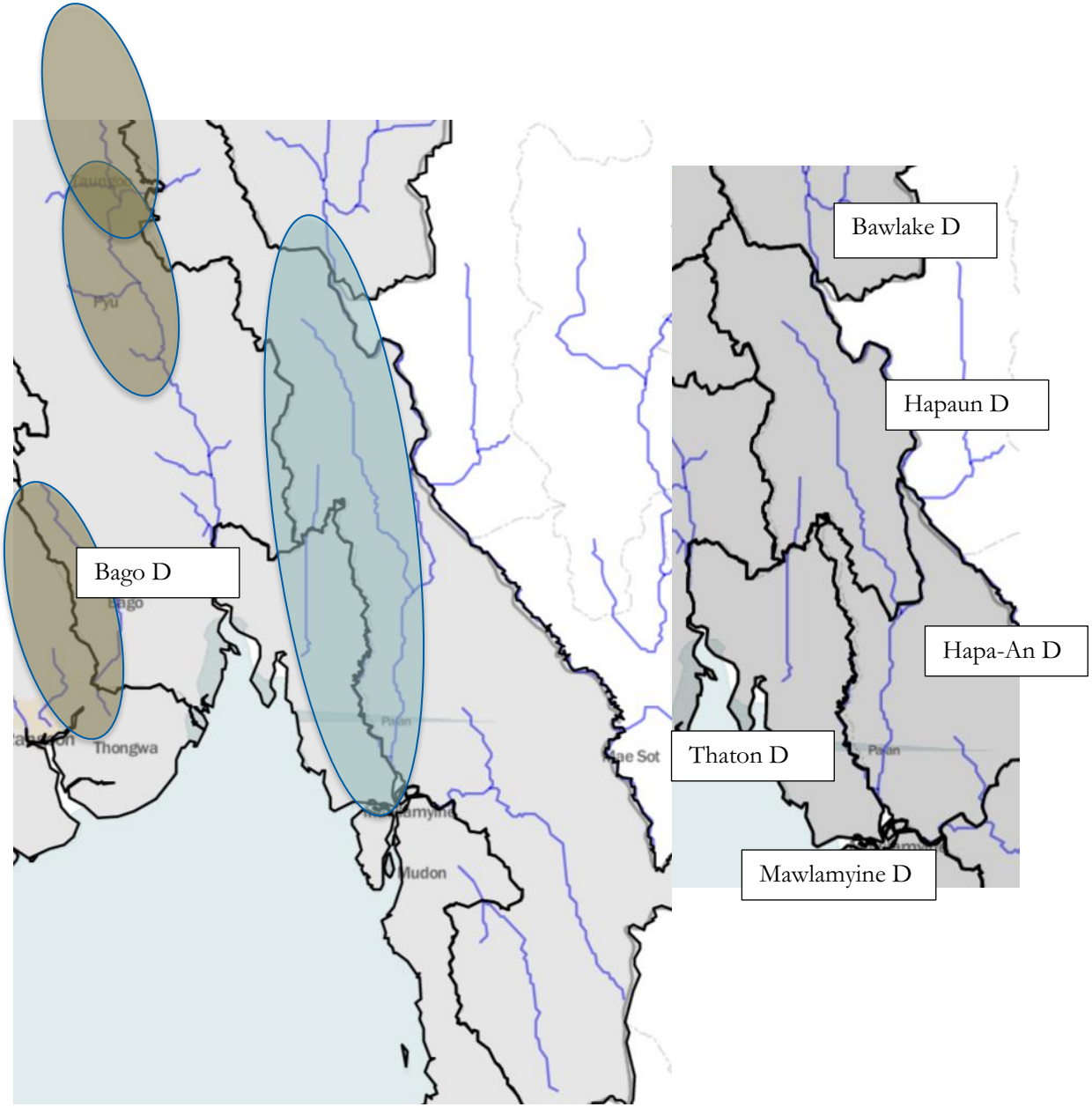


22. Balu Chaung sub-basin. The sub-basin starts in Taungyi D. and the river flows into Loikaw D. The sub-basin includes Inle lake.

23. Nam Et Sub-basin. The basin starts in Taungyi D, it includes a tributary in Langkho D, it flows south and together with Balu Chaung and it stops where it enters into Thanlwin.



24 .Lower Thanlwing sub-basin



25 A. **Nay Pyi Taw sub-basin**

25 B. **Taungoo sub-basin**

25 C**. Bago Sub-basin Area**. Bago District

NIVA: Norges ledende kompetansesenter på vannmiljø

NIVA gir offentlig vannforvaltning, næringsliv og allmennheten grunnlag for god vannforvaltning gjennom oppdragsbasert forsknings-, utrednings- og utviklingsarbeid. NIVA kjennetegnes ved stor faglig bredde og godt kontaktnett til fagmiljøer i inn- og utland. Faglig tyngde, tverrfaglig arbeidsform og en helhetlig tilnærmingsmåte er vårt grunnlag for å være en god rådgiver for forvaltning og samfunnsliv.

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