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Report No: PAD987

INTERNATIONAL DEVELOPMENT ASSOCIATION

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED CREDIT

IN THE AMOUNT OF SDR 67.5 MILLION
(US\$100 MILLION EQUIVALENT)

TO THE

REPUBLIC OF THE UNION OF MYANMAR

FOR A

AYEYARWADY INTEGRATED RIVER BASIN MANAGEMENT PROJECT
November 12, 2014

Water Global Practice
East Asia and Pacific Region

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CURRENCY EQUIVALENTS

(Exchange Rate Effective: September 30, 2014)

Currency Unit = SDR
SDR 0.67450 = US\$1
US\$1.48258 = SDR 1

FISCAL YEAR
January 1 – December 31

ABBREVIATIONS AND ACRONYMS

ACAS	Agriculture and Climate Advisory Service
ADPC	Asian Disaster Preparedness Center
AWS	Automated Weather Station
AIRBM	Ayeyarwady Integrated River Basin Management
CM	Component Manager
CMU	Component Management Unit
DMH	Department of Meteorology and Hydrology, MoT
DRM	Disaster Risk Management
DSS	Decision Support System
DWIR	Directorate of Water Resources and Improvement of River Systems, MoT
EA	Environmental Assessment
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
EWS	Early Warning System
FM	Financial Managements
GoM	Government of the Republic of the Union of Myanmar
HIC	Hydro-Informatics Center
ICB	International Competitive Bidding
ICT	Information and Communications Technology
IDA	International Development Association
IPP	Indigenous Peoples Plans
IPPF	Indigenous Peoples Planning Framework
M&E	Monitoring and Evaluation
MEB	Myanma Economic Bank
MoF	Ministry of Finance
MoT	Ministry of Transport
NCB	National Competitive Bidding
NGO	Non-Governmental Organization
NWP	Numerical Weather Prediction
NMS	National Hydro-Meteorological Service
NWRC	National Water Resources Committee
PCR	Physical Cultural Resources

PFI	Preparation of Future Investments
PMU	Project Management Unit
PSC	Project Steering Committee
PWS	Public Weather Service
RAP	Resettlement Action Plan
RPF	Resettlement Policy Framework
RBO	River Basin Organization
SCD	Systematic Country Diagnostics
SESA	Strategic Environmental and Social Assessment
SOPs	Standard Operating Procedures
VDMC	Village Disaster Management Committee
WBG	World Bank Group
WMO	World Meteorological Organization
WRF	Weather Research and Forecasting Model

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MYANMAR
Ayeyarwady Integrated River Basin Management Project

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PAD DATA SHEET

Myanmar

Ayeyarwady Integrated River Basin Management Project (P146482)

PROJECT APPRAISAL DOCUMENT

EAST ASIA AND PACIFIC

Report No.: PAD987

Basic Information			
Project ID P146482	EA Category A - Full Assessment	Team Leaders Greg J. Browder Claudia Sadoff	
Lending Instrument Investment Project Financing	Fragile and/or Capacity Constraints []		
	Financial Intermediaries []		
	Series of Projects [X]		
Project Implementation Start Date 31-Mar-2015	Project Implementation End Date 31-Mar-2020		
Expected Effectiveness Date 15-May-2015	Expected Closing Date 30-Sep-2020		
Joint IFC No			
Practice Manager Ousmane Dione	Senior Global Practice Director Junaid Kamal Ahmad	Country Director Ulrich Zachau	Regional Vice President Axel van Trotsenburg
Borrower: Republic of the Union of Myanmar			
Responsible Agency: Directorate of Water Resources and Improvement of River Systems, Ministry of Transport			
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Project Financing Data(in US\$Million)			
[] Loan	[] IDA Grant	[] Guarantee	
[X] Credit	[] Grant	[] Other	
Total Project Cost:	100.00	Total Bank Financing:	100.00
Financing Gap:	0.00		

Financing Source	Amount
BORROWER/RECIPIENT	0.00
International Development Association (IDA)	100.00
Total	100.00

Expected Disbursements (in US\$Million)

Fiscal Year	2015	2016	2017	2018	2019	2020	2021	0000	0000	0000
Annual	0.00	5.00	10.00	20.00	25.00	30.00	10.00	0.00	0.00	0.00
Cumulative	0.00	5.00	15.00	35.00	60.00	90.00	100.00	0.00	0.00	0.00

Institutional Data

Practice Area / Cross Cutting Solution Area

Water

Cross Cutting Areas

- Climate Change
- Fragile, Conflict & Violence
- Gender
- Jobs
- Public Private Partnership

Sectors / Climate Change

Sector (Maximum 5 and total % must equal 100)

Major Sector	Sector	%	Adaptation Co-benefits %	Mitigation Co-benefits %
Water, sanitation and flood protection	General water, sanitation and flood protection sector	40	80	
Water, sanitation and flood protection	Flood protection	25	80	
Transportation	Ports, waterways and shipping	25	80	80
Public Administration, Law, and Justice	Public administration- Water, sanitation and flood protection	10	80	80
Total		100		

I certify that there is no Adaptation and Mitigation Climate Change Co-benefits information applicable to this project.

Themes

Theme (Maximum 5 and total % must equal 100)

Major theme	Theme	%
-------------	-------	---

Environment and natural resources management	Water resource management	60
Social protection and risk management	Natural disaster management	20
Environment and natural resources management	Environmental policies and institutions	20
Total		100

Proposed Development Objective(s)

The program development objective for the Series of Projects (of which the AIRBM will be the first) is to strengthen integrated, climate resilient management and development of the Ayeyarwady River Basin and national water resources.

The project development objective of the AIRBM is to contribute to the development of integrated river basin management on the Ayeyarwady River.

Components

Component Name	Cost (US\$ Millions Equivalent)
Component 1: Water Resource Management Institutions, Decision Support Systems and Capacity Building	32.00
Component 2. Hydro-meteorological Observation and Information Systems Modernization	30.15
Component 3. Navigation Enhancement on the Ayeyarwady River	37.85
Component 4. Contingent Emergency Response	0.00

Compliance

Policy

Does the project depart from the CAS in content or in other significant respects?	Yes []	No [X]
Does the project require any waivers of Bank policies?	Yes []	No [X]
Have these been approved by Bank management?	Yes []	No []
Is approval for any policy waiver sought from the Board?	Yes []	No [X]
Does the project meet the Regional criteria for readiness for implementation?	Yes [X]	No []

Safeguard Policies Triggered by the Project	Yes	No
Environmental Assessment OP/BP 4.01	X	
Natural Habitats OP/BP 4.04	X	
Forests OP/BP 4.36	X	
Pest Management OP 4.09	X	
Physical Cultural Resources OP/BP 4.11	X	
Indigenous Peoples OP/BP 4.10	X	

Involuntary Resettlement OP/BP 4.12		X	
Safety of Dams OP/BP 4.37		X	
Projects on International Waterways OP/BP 7.50		X	
Projects in Disputed Areas OP/BP 7.60			X
Legal Covenants			
Name	Recurrent	Due Date	Frequency
Institutional Arrangements	X		CONTINUOUS
Description of Covenant			
Obligation of the Recipient to maintain, at all times during the implementation of the Project, the Project Steering Committee, the Project Management Unit, the Component Management Units, and the Stakeholders Forum.			
Name	Recurrent	Due Date	Frequency
Project implementation manual	X		CONTINUOUS
Description of Covenant			
Obligation of the Recipient to carry out the Project in accordance with the Project implementation manual.			
Name	Recurrent	Due Date	Frequency
Contingent Emergency Response	X		CONTINUOUS
Description of Covenant			
Obligation of the Recipient to adopt a satisfactory Contingent Emergency Response Implementation Plan for Component 4 of the Project and, in the event of an eligible crisis or emergency, ensure that the activities under said component are carried out in accordance with such plan and all relevant safeguard requirements.			
Name	Recurrent	Due Date	Frequency
Environmental and Social Safeguards	X		CONTINUOUS
Description of Covenant			
Obligation of the Recipient to carry out the Project in accordance with the ESMF and related safeguard assessments and plans.			
Conditions			
Source Of Fund	Name		Type
IDA	Withdrawal Condition		Condition of disbursement
Description of Condition			
The Recipient shall adopt a satisfactory Contingent Emergency Response Implementation Plan for Component 4 of the Project and, in the event of an eligible crisis or emergency, ensure that the activities under said component are carried out in accordance with such plan and all relevant safeguard requirements.			

Team Composition			
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Locations

Country	First Administrative Division	Location	Planned	Actual	Comments
Myanmar	Component 1: national. Component 2: Mandalay Region. Component 3: national.	Specific navigation enhancement sites in the Mandalay Region will be determined during implementation by final designs (activity 2.1.c.) Hydromet upgrading will be on a national scale with specific works identified during implementation by the systems design (activity 3.1.a.)			Institutional development activities will be national in scope.

I. STRATEGIC CONTEXT

A. Country Context

1. Myanmar, with a population of around 51.4 million¹, has the lowest Gross Domestic Product (GDP) per capita and one of the highest poverty rates in Southeast Asia. The poverty headcount rate is officially estimated at 37.5 percent (World Bank, 2014). Myanmar is also the largest country in mainland Southeast Asia and is endowed with abundant natural resources.
2. Long military rule, conflict in the border areas, centrally planned and executed policies, and international isolation explain its low level of development. A reduced role of the private sector, under-developed markets, weak foreign investment, and underinvestment took a toll on public institutions and social services.
3. Upon assuming office in 2011, the new Government announced a series of far-reaching reforms that aim for a triple transition: from a military system to democratic governance; from a centrally-directed, closed economy to a market-oriented one; and from 60 years of conflict to peace in the border areas.
4. GDP grew at an average rate of 5.1 percent per year between 2005-06 and 2009-10, and at 6.5 percent since the transition began. Myanmar successfully completed an International Monetary Fund (IMF) Staff Monitored Program and international relations, including reengagement with the World Bank Group (WBG), have become largely normalized.
5. Despite progress across the three transitions, the situation remains fragile. The next elections may demonstrate the strength of the new democratic system. The peace process is tenuous and religious tensions persist, with outbreaks of violence, primarily in the Rakhine State.
6. The pace of change in Myanmar is rapid and expectations are high. In this period of transformation, the Government will be challenged to ensure that growth is environmentally sustainable and inclusive. Water policies and early water infrastructure investment decisions will have profound impacts, both positive and negative, on the health and productive potential of the country's water resources. It will also set the stage for the way in which future developments in river navigation, agriculture, energy and industry will be carried out.

B. Sectoral and Institutional Context

7. Myanmar is a land and water rich country. It has the world's 25th largest arable land area and was once the world's largest rice exporter. It has more than twice the renewable freshwater resources per capita of the United States, nearly ten times that of India and over 15 times more than China.
8. The development of the Ayeyarwady Basin and Myanmar's water resources more broadly will have far-reaching consequences for growth, poverty alleviation and inclusiveness

¹ On August 30, 2014, the government officially announced this provisional figure based on 2014 Census.

across the economy. Providing reliable access to water of good quality at an affordable price creates economic opportunities. Not doing so effectively forecloses opportunities. Therefore the policies and infrastructure investments that are implemented, for example, to allocate water between alternative uses, to deliver water at specific times to specific geographic regions, to protect water quality, and to protect people and assets from water-related hazards, will create opportunities and risks for different regions, sectors, groups and individuals. This in turn can have a profound impact on growth, inclusiveness and the structure of the economy.

9. The Ayeyarwady is Myanmar's largest river basin and has been described as the heart of the nation. The basin accounts for about 60 percent of Myanmar's landmass and is home to some 70 percent of its population. The river runs from the mountain ranges in the north, through the agriculturally important dry zone in the middle basin, to the productive yet fragile delta in the south. Due to the relatively high share of the population in the dry zone and the delta, these two regions account for nearly two-thirds of the poor in Myanmar.

10. The Ayeyarwady is a river of global proportions, with an average annual flow of over 400 billion cubic meters, or roughly 85 percent of the Mekong.² Groundwater resources in the basin are believed to be equivalent to at least 50 percent of the basin's current surface water storage volume,³ and countrywide as high as perhaps 495 billion cubic meters.⁴

11. Hydropower development, however, remains a focus of interest and a potential source of significant economic benefits. In total, Myanmar has an estimated 100,000 MW of potential hydropower capacity, of which 2,600 MW has already been developed. The Ayeyarwady river system alone is believed to account for 38,000 MW of potential capacity. Currently, there are no dams on the mainstream of the Ayeyarwady River. Construction on what would have been the first mainstream dam (a large storage-backed hydropower dam at Myitsone) was halted in 2011 due to public concerns. Myanmar has significant opportunities to develop hydropower, but currently lacks the data and decision support tools needed to understand the basin-wide impacts of these developments and the tradeoffs of alternative development options.

12. Agriculture in the Ayeyarwady Basin has historically been the mainstay of the Myanmar economy. Myanmar's wealth of land and water resources have made the country food secure; but exports and incomes could be significantly enhanced by increasing agricultural productivity and diversifying production.

13. The river's high sediment load appears to be compromising navigation on the river. The Ayeyarwady has the 5th highest sediment load of any major river in the world and many believe that the rate of sedimentation is rapidly increasing as a consequence of deforestation in the river's fragile upstream landscape and widespread land use changes across the basin. Heavy,

² Annual volumes of the Ayeyarwady (410 billion cubic meters- bcm) and the Mekong (475 bcm) are as reported by the Government of Myanmar and the Mekong River Commission, respectively. Recent literature (Robinson et al. 2007) suggests the Ayeyarwady's volume may be even higher, in the range of 420 to 440 billion cubic meters (+/- 48 bcm).

³ See IWMI's "Water Resources Assessment of the Dry Zone of Myanmar", McCartney et al. (2013).

⁴ Department of Irrigation, Government of Myanmar.

shifting sediment deposits now hamper navigation in the low flow season (November to May) when the depth is insufficient for large or heavily loaded vessels to ply.

14. Water quality and quantity are increasing concerns. Water quality concerns are being raised with regard to mining activities as well as the anticipated growth of cities and industrial zones. In response, the government has introduced Environmental and Social Impact Assessment (ESIA) requirements and taken steps to improve the regulation of industries, including its successful bid to obtain Candidate Country status with the Extractive Industries Transparency Initiative (EITI). Water scarcity is an issue today only in the basin's 'Dry Zone', but conflicting demands are likely to arise if Myanmar continues its current rapid growth and the development of Special Economic Zones in the basin.

15. Extreme climate events such as severe weather, storms and floods are another set of concerns in the Ayeyarwady Basin. Climate change will likely intensify these risks. The 'dry zone' is prone to droughts, the valley and delta experience extensive flooding, and the coastal zones are vulnerable to sea level rise and storms such as cyclone Nargis which in 2008 killed an estimated 138,000 people and affected 2.4 million.

16. Ecosystem health and related eco-tourism opportunities also need to be taken into account in the development of Myanmar's water resources. The Ayeyarwady Basin is home to numerous emblematic and endangered species including elephants, tigers, leopards, sea turtles, crocodiles, a broad range of waterfowl and migratory birds, and the Irrawaddy dolphin.

17. Looking forward and for the long-term it is clear that many of the growth opportunities considered most promising for Myanmar relate directly to water, for example enhanced production and trade in agricultural products, hydropower generation, and the expansion of national and regional green transport systems via rivers and ports. Anticipated growth in cities, industry, and cultural/eco-tourism will also require more water. It is important that the government has the capacity to anticipate the inter-relationships among the various demands that will be placed on water across its burgeoning portfolio of development investments.

18. In addition many of the drivers of poverty are related to water management. The SCD identified low agricultural productivity, erratic rainfall, and lack of access to markets due to poor rural infrastructure as major drivers of poverty. Better management of water resources could increase agricultural productivity; better weather forecasts and water storage strategies could mitigate the impacts of erratic rainfall and extreme weather events; and enhanced navigation on the Ayeyarwady could provide low cost access to markets for rural farmers.

19. In recognition of the importance and timeliness of water resources management during this period of rapid transformation, a National Water Resources Committee (NWRC) was established by Presidential decree in July 2013 to manage the broad inter-related risks and opportunities of the Ayeyarwady River and Myanmar's water resources. The NWRC, chaired by the Vice President, has three pillars: (a) a Secretariat; (b) a Hydro-Informatics Center (HIC); and (c) an Expert Group. The NWRC will function as an apex body to oversee the efforts of the 34 government agencies that currently have mandates affecting water.

C. Higher Level Objectives to which the Project Contributes

20. The proposed project is directly aligned with the World Bank Group's twin goals to reduce poverty and promote shared prosperity. The project will help reduce poverty by: (a) contributing to the delivery of more reliable services and better quality water for human health, economic production including agricultural which accounts for 52 percent of the workforce, and ecosystem sustainability; (b) enhancing hydromet services to strengthen climate adaptation capacity, disaster risk management and agricultural productivity, which will contribute to greater, more stable incomes for climate vulnerable groups and rain-fed farmers; and (c) safe, economical inland water transport that will provide increased opportunities for trade, market access and mobility. The project will contribute to the goal of shared prosperity by benefiting in particular the poor, vulnerable groups and women who tend to be disproportionately harmed by water-related disasters and hampered by lack of access to water services.

21. The project aligns directly with the WBG Interim Strategy Note for Myanmar for the period FY13-14, which was discussed at the Board on November 1, 2012. The project directly supports Pillar 1: Transforming Institutions, by supporting the development of water resource management institutions. The high level of stakeholder engagement planned under the project will also support Pillar 2: Building Confidence in the Reform Process. Finally, the project aligns with Pillar 3: Preparing for the Road Ahead, by building capacity and laying the foundation for a potential future series of projects in the water sector.

22. The Country Partnership Framework (CPF) for Myanmar, covering FY15 through FY17, is under preparation, with an expected delivery in Quarter 4 of FY15. Currently at concept stage, the CPF envisions a central role for rural poverty reduction, as well as for building capacity of national systems and mitigating disaster risks, and makes specific reference to the project in this respect. The CPF will draw on a Systematic Country Diagnostic (SCD) for Myanmar which is currently being finalized.

23. The Project will also contribute to the Association of Southeast Asian Nations (ASEAN) Economic Community (AEC) vision of an integrated Southeast Asian community by increasing capacity to produce surplus agriculture and power for export, and facilitating regional trade through inland water transport routes as both India and China are exploring possible investments in rail connections to their borders near the upper reaches of the Ayeyarwady River.

24. The AIRBM complements IFC's activities in Myanmar, and opportunities for collaboration will be explored during project implementation. IFC supports reforms and investments in Myanmar to revive the private sector. Since IFC re-engaged with Myanmar in August 2012, its portfolio has grown to include 14 investment and advisory projects, mainly in the infrastructure and banking sectors. The project will help establish a river basin planning framework to enable sound water-related infrastructure investments, potentially including private sector financing. IFC has an on-going program in the region to promote environmental and social standards for sustainable hydropower, which could potentially be drawn upon to help support the project.

25. The WBG is coordinating with other development partners working in the areas of water resources management, disaster risk management and inland water transport. Donors undertaking complementary activities include Australia, Finland, Germany, Japan, Korea, the Netherlands, Norway, Switzerland, the United States, the Asian Development Bank (ADB), and the United Nations Development Programme (UNDP).

26. In particular, the WBG will work closely with the Government of the Netherlands (GoN) which provided technical assistance for the preparation of this project and will continue to collaborate in at least three areas: (a) Navigation – GoN has indicated its intention to provide technical assistance to the GoM to undertake the design and feasibility studies of the first phase of channel enhancement works; (b) Capacity Building – GoN is currently undertaking a needs assessment for capacity building in water resources management that will provide valuable guidance for prioritization of the capacity building funds made available under this project; and (c) Integrated Water Resources Management (IWRM) – the GoN is working with the GoM to develop an IWRM strategy that will identify and prioritize key investments for Myanmar, this will provide input to the Ayeyarwady Integrated River Basin Master Plan (activity 1.2).

27. Coordination with Japan International Cooperation Agency (JICA) will also be a priority. With regard to Component 2, JICA is making a significant investment (over US\$40M) in Myanmar's severe weather warning systems, including the introduction of Doppler radar meteorology and other modern techniques. The AIRBM and JICA programs have agreed to coordinate closely to modernize the DMH systems. The operational system to be developed by the AIRBM will fully integrate the design of the future Doppler radar sub-system being financed by JICA. In addition, the World Meteorological Organization (WMO) is exploring options to support project implementation by providing training and capacity building for DMH staff. WMO will also explore options to include DMH in a number of WMO flagship initiatives such as the Severe Weather Forecast Demonstration Project (SWFDP), the Flash Flood Guidance System (FFGS), and the Global Framework for Climate Services (GFCS).

28. In relation to Component 3, with the support of JICA, the GoM prepared a National Transport Development Plan (currently in draft form) and has triggered interest for supporting future investments in multi-modal transportation in the Western North-South Corridor (Yangon-Pyay-Magway) where Component 3 navigation enhancement works are located. Along with GoM, the WBG will work closely with development partners to ensure synergies in investments in the country's transport network.

II. PROJECT DEVELOPMENT OBJECTIVES

A. PDO

29. The program development objective for the Series of Projects (of which the AIRBM will be the first) is to strengthen integrated, climate resilient management and development of the Ayeyarwady River Basin and national water resources.

30. The project development objective of the AIRBM is to contribute to the development of integrated river basin management on the Ayeyarwady River.

31. The project would also support a prompt and effective response to potential crises and emergencies.

B. Project Beneficiaries

32. Direct beneficiaries of the project will include those in water-dependent sectors and water-vulnerable communities. Examples of beneficiaries include:

- *Government Water Agencies and Water Users:* Institutional reforms and capacity building for managing the nation's water resources will promote more effective management of the quantity, quality and reliability of water resources for all water users in Myanmar. This will strengthen the government's capacity to provide clean drinking water, deliver timely and reliable water for irrigation, hydropower generation and industries, and sustain ecosystem services including buffering saline intrusion in the delta.
- *Vulnerable Communities Affected by Hydrological Events:* Modernization of the country's hydro-meteorological observation and warning systems will help protect the lives and livelihoods of those living in areas affected by drought, floods and storms. Those who are exposed to hazards generally tend to be poor, and women are often disproportionately harmed by disasters. Improving access to and accuracy of agricultural advisories should increase farmers' productivity.
- *Navigation Users:* Enhancements in navigation will benefit inland water transport operators by increasing river depth to allow safer, more reliable and more efficient shipping.

33. Indirect beneficiaries include consumers that will benefit from improved agriculture production as a result of improved weather information services, consumers of goods that will be transported more reliably and cost effectively on the Ayeyarwady River, and the general population that will benefit from the enhanced economic and environmental benefits that can be derived from integrated basin management and planning.

34. The use of public sector financing for the project is considered appropriate given the fact that it focuses on: (i) strengthening public institutions (i.e., the legal, institutional and knowledge tools needed by the government to manage the country's water resources); and (ii) providing public goods (i.e., integrated basin management, primary biophysical data, disaster warnings, agricultural advisories, and transport infrastructure).

C. PDO Level Results Indicators

35. The following indicators will be used to measure progress in meeting the project development objectives:

- Development of a comprehensive river basin development plan, supported by an advanced decision support system, to guide the sustainable development and management of the Ayeyarwady river basin.
- Preparation of high priority water resource investment projects aligned with the Ayeyarwady River Basin Master Plan.
- Development of a functional system of hydro-met stations operating under standard operating conditions.
- Creating a national scale hydrological-meteorological system producing useful information for water resources management, agricultural, and disaster risk management purposes.
- Navigation improvements along the stretch of the Ayeyarwady meeting the desired operating standards.

III. PROJECT DESCRIPTION

A. Project Components

36. The project design includes three inter-related investment components plus a contingency component to allow for rapid reallocation of funds if emergencies arise. The project would include the following components:

Component 1: Water Resource Management Institutions, Decision Support Systems and Capacity Building (US\$32 million equivalent)

1.1 Institutional Development (US\$10.5 million equivalent): This sub-component will support: (a) design and construction of a new NWRC Secretariat and HIC headquarters facility in Mandalay, immediate refurbishment of associated office space in Yangon and Nay Pyi Taw, and provision of office furnishings and equipment; (b) development of the NWRC institutions, mandates, business plans, staffing strategies and operational procedures, as well as institutional, legal and regulatory reviews and reforms relating to water resources management; and (c) capacity building, including possible twinning arrangements.

1.2 Ayeyarwady River Basin Master Plan and Decision Support System (DSS) (US\$10 million equivalent): This sub-component will provide immediate guidance on investment options while also developing the tools and processes needed to ensure the government has ongoing capacity to plan and manage its national water resources. A phased approach will be taken to plan integrated development of the Ayeyarwady River, based on sufficient understanding of opportunities and risks and guided by agreed Basin Development Objectives. Activities will include: (a) development of the Ayeyarwady Integrated River Basin Master Plan, the development of a DSS that will become the primary knowledge asset of the HIC, and stakeholder consultations to identify Basin Development Objectives; (b) implementation of groundwater and sediment surveys; and (c) implementation of a Basin-wide Strategic Environmental and Social Assessment (SESA).

1.3 Preparation of Future Investments (PFI) (US\$7 million equivalent): This sub-component will support preparation activities for priority investments that may be financed under future

phases of this Series of Projects. It will finance feasibility studies, procurement and safeguards related activities, workshops and study tours and other activities as agreed between the WBG and GoM. It will not finance detailed design work. This financing will create an incentive to develop projects within the NWRC framework – to identify, and prepare projects to international quality standards, within an integrated basin framework and in accordance with basin wide development objectives. To be eligible for PFI funding, a project must be consistent with the Ayeyarwady Basin Master Plan (Sub-component 1.2a) and with the Bank’s engagement objectives in Myanmar.

1.4 Implementation Support (US\$4.5 million equivalent): This sub-component will provide funds for: (a) consultant and advisory services for the Project Management Unit (PMU) including for financial management, procurement, safeguards and monitoring and evaluation; (b) incremental operating costs; and (c) project-related communications and outreach as well as the creation of a Stakeholder Forum that will be an important mechanism for consultation during the implementation of this Project and sustained thereafter as a platform for stakeholder engagement with the NWRC.

Component 2: Hydro-meteorological Observation and Information Systems Modernization (US\$30.15 million equivalent)

2.1 Institutional and Regulatory Strengthening, Capacity Building and Implementation Support (US\$6 million equivalent): This sub-component will support: (a) institutional strengthening including the development of a robust legal and regulatory framework; (b) capacity building and training for staff; and (c) technical assistance in systems design, integration and operations as well as Component 2 management and monitoring.

2.2 Modernization of Observation Infrastructure, Data Management Systems and Forecasting (US\$17.1 million equivalent): This sub-component will support: (a) technical upgrading of the hydro-meteorological observation network; (b) modernization of operations centers, data management and communications/IT systems, engineering and calibration facilities; (c) improvements in numerical weather prediction systems and associated hydrological modeling systems; and (d) reconstruction and refurbishment of offices and facilities.

2.3 Enhancement of Hydromet Service Delivery Systems (US\$7.05 million equivalent): This sub-component will support the strengthening and delivery of hydromet information services in order to ensure project benefits are realized across the range of stakeholders. This will likely include: (a) creation of a Service Delivery Platform for weather and hydrological services; (b) support for disaster risk management (DRM) operations including expansion of "end-to-end" early warning systems in small river basins with floods and flash floods; (c) development of an Agricultural and Climate Advisory Service (ACAS); and (d) the creation of a National Framework for Climate Services.

Component 3: Navigation Enhancement on the Ayeyarwady River (US\$37.85 million equivalent)

3.1 Navigation Improvements (US\$30.35 million equivalent): This sub-component will support navigation improvements to increase water levels during the low water season for both passenger

and cargo vessels, primarily along the busiest stretches of the Ayeyarwady river. This sub-components activities will include: (a) 1-dimensional and 2-dimensional river modeling to identify the scope of works for river navigation enhancements, sedimentation modeling which is essential for effective operations and maintenance, preparation of detailed design documents, cost estimates and bidding documents, and supervision of construction work; (b) preparation of an Environmental and Social Impact Assessment (ESIA), including site-specific Environmental and Social Management Plans (ESMPs), and if needed site-specific Resettlement Plans and Indigenous Peoples Plans, for the proposed enhancement works; and (c) construction of the enhancement works. The scope of works will initially focus on the Mandalay – Nyaung Oo section of the Ayeyarwady River and will be expanded to other critical stretches between Nyaung Oo and Yangon.

3.2 Navigation Aids (US\$3.4 million equivalent): This sub-component will support: (a) the purchase and installation of navigation aids such as buoys, signage, modern GPS mapping, communications systems (requiring survey boats, echo-sounding equipment and radar) and the installation of lighting and signage systems to enable night time navigation on the Mandalay – Nyaung Oo section of the River; and (b) a strengthened river pilot system to enhance safety and facilitate efficient navigation along the Mandalay – Yangon section of the Ayeyarwady.

3.3 Water Quality Monitoring (US\$2 million equivalent). This component will support the design and piloting of a water quality monitoring system.

3.4 Institutional Strengthening and Implementation Support (US\$2.1 million equivalent): This component will support: (a) Component 3 implementation costs; (b) a fleet optimization study to improve transport efficiency by ensuring that fleet development is well suited to the river; and (c) capacity building, training and communications and awareness raising activities related to the Project-sponsored river improvements and new information, regulations and procedures.

Component 4: Contingent Emergency Response (US\$0 million equivalent)

37. This ‘zero component’ (initially without any allocated funding) will allow for the rapid reallocation of funds from other components to provide emergency recovery and reconstruction support in the event of a natural disaster, emergency and/or catastrophic event. Funds potentially reallocated to Component 4 would be disbursed either against a positive list of critical goods and/or against the procurement of works, and consultant services required to support the immediate response and recovery needs of the GoM. A Contingent Emergency Response Implementation Plan will be developed to guide financial management, procurement, safeguard and any other necessary implementation arrangements and procedures.

B. Project Financing

Lending Instrument

38. The proposed operation will be financed by IDA credit on standard terms with a 38 year maturity and a six year grace period. The credit will be provided through a Financing Agreement between the Republic of the Union of Myanmar, represented by the Ministry of Finance (MoF),

and IDA. The MoF will make the proceeds of the credit available to the Ministry of Transport (MoT) through the government’s budget.

Project Cost and Financing

39. Project cost and financing requirements for the investment components are presented in the table below (See Annex 1 for estimated activity breakdown). The project will be financed by IDA. Any compensation that may be required for resettlement associated with Project activities will be financed by the Government.

Project Components	IDA Financing (US million Equivalent)	Percent Financing
1: Water Resource Management, DSS & Capacity Building	32.00	100%
2: Hydromet and Information Systems Modernization	30.15	100%
3: Navigation Enhancement on the Ayeyarwady River	37.85	100%
4: Contingent Emergency Response	0.00	
Total Project Costs	US\$100 million	
Front-End Fees	0	
Total Financing Required	US\$100 million	

C. Series of Project Objectives and Phases

40. The program development objective for the Series of Projects (of which the AIRBM will be the first) is to strengthen integrated, climate resilient management and development of the Ayeyarwady River Basin and national water resources.

41. In this first phase, the focus will be to develop the institutions and tools needed to enable informed decision making in the management of Myanmar’s national water resources and to implement integrated river basin management on the Ayeyarwady, while immediately enhancing the river’s productivity with “low/no regrets” investments in the hydro-meteorological observation system and services (to support agricultural productivity and water-related disaster risk management) and in navigation enhancements (to promote sustainable transportation) on the Ayeyarwady. The project would also support a prompt and effective response to potential crises and emergencies.

42. These key early investments will lay the groundwork needed to undertake good practice water resources management and large-scale infrastructure investments, some of which could be included in future phases of this program. They will also provide the government with the capacity to do basin-wide scenario analyses, to properly identify and assess the complex trade-offs that inevitably arise from large long-lived water infrastructure investments, and to better follow economic, environmental and social ‘good practice’.

43. The program is envisaged as a multi-phased, overlapping Series of Projects. This structure was developed in recognition of the importance of building institutions and knowledge for long-term development, while at the same time demonstrating immediate benefits to the country. An overlapping structure will allow the preparation and launch of additional investment

projects before the completion of this first Project. Potential future investments, which would be financed in subsequent Bank-financed projects, include irrigation and drainage, flood control, hydropower, navigation, delta management, municipal water supply, and municipal wastewater.

44. To facilitate a pipeline of investments the AIRBM will deliver a rolling Master Plan for the Ayeyarwady Basin that will identify priority projects that align with the overall Basin Development Objectives and can be prepared without undue risk prior to the completion of the full Master Plan. This Project will also provide funding (under the PFI) for feasibility studies and related preparation activities to expedite the development of a pipeline of investments. For a schematic overview of a potential overlapping Series of Projects see Annex 7; with the caveat that the specific types of investments to be made in subsequent phases will be determined by the analysis and consultations undertaken in Phase 1.

D. Lessons Learned and Reflected in the Project Design

45. The lessons learned that are reflected in this project's design have been gleaned from WBG experience in other large river basin programs such as the Nile, the Shire, the Zambezi, the Mekong and the Murray Darling. Key lessons include the importance of:

a) *Institutional strengthening and capacity building:*

The management and development of large river basins is complex and usually contentious. Effective management requires strong institutions with robust knowledge bases and transparent processes for stakeholder consultation, analysis and decision-making.

b) *Balancing investments in institutions and infrastructure:*

Although specific contexts differ greatly, all large basins require some combination of institutions and infrastructure to deliver benefits to people and to sustain ecosystems.

c) *Pairing river basin planning with efforts to facilitate implementation:*

To facilitate implementation on the ground, technocratic approaches (modeling, mapping, guidelines, etc.) need to be accompanied by effective engagement, communications and consultation with a broad range of stakeholders.

d) *Adopting a measured approach to infrastructure development:*

Infrastructure development should not move ahead of a government's capacity to identify and appraise the economic, environmental and social tradeoffs in river basin development, and to appropriately design and sustainably operate costly, long-lived infrastructure.

e) *Communications, outreach and constituency building:*

Robust stakeholder engagement is essential for the project design, implementation and sustainability.

f) *Long-term commitment:*

River basin management and development is a long-term process that requires a long-term adaptive planning horizon and a long-term commitment.

46. With regard to the hydromet modernization specifically, lessons were drawn from WBG-financed hydromet projects in Central Asia, Yemen and Nepal: (i) sustainability often hinges on the availability of recurrent budgets related to the O&M of upgraded facilities and the ability to attract, train and retain staff with the skills profiles required to run modernized systems; and (ii) modernization programs require significant technical supervision.

47. Lessons relevant for Myanmar were drawn from the Myanmar Interim Strategy Note (ISN) which suggested that capacity constraints in the areas of financial management, procurement, monitoring and evaluation and safeguards need to be addressed in project design. More specifically, learning was drawn from the WBG's financing in 1988 of the Irrawaddy and Lower Chindwin Rivers Study which laid out recommendations for navigation improvements few of which were ever implemented. It was confirmed by government that there has been a continued interest in implementing those recommendations, hampered only by the lack of available funds. Hence this Project includes a PFI component to facilitate the uptake and implementation of the Master Plan recommendations.

48. Lessons from the ISN and EITI consultations highlighted distrust between CSOs and the government, but suggest that this can be attenuated by demonstrating an awareness of problems with past practices, undertaking frequent and open communications with civil society leaders, and fostering positive interactions between government and civil society.

IV. IMPLEMENTATION

A. Institutional and Implementation Arrangements

49. **DWIR/NWRC Secretariat:** The Directorate of Water Resources and Improvement of River Systems (DWIR) will be the implementing agency of the AIRBM and the Director General (DG) of DWIR will have managerial and financial oversight of the Project. The DG of DWIR also serves as the Secretary of the NWRC Secretariat which is a key agency in the Project. The Director General/Secretary's dual role should help to ensure coordination among different entities.

50. **The AIRBM Project Steering Committee (PSC):** The NWRC will provide strategic guidance to the AIRBM and receive regular updates on progress. For purposes of immediate project oversight, an AIRBM Project Steering Committee (PSC) will be formed by the NWRC to review annual progress reports, work programs and key processes and outputs. The PSC will be chaired by the Deputy Vice Minister, MoT, and include three or four officials of the NWRC.

51. **Project Management Unit (PMU) and Component Management Units (CMUs):** A PMU will be established under DWIR/NWRC Secretariat, and led by a Project Director. The Project Director will be responsible for project management and technical coordination, as well as procurement and financial management, monitoring and evaluation, and compliance with environmental and social safeguards for all project components. Financial management and procurement functions will be undertaken by existing staff of DWIR, with additional support from consultants to be hired under the project as needed. In addition, CMUs will be established for each of the three Components reflecting the components' distinct technical focuses and relationships to different Departments within the MoT. Each CMU will be led by a Component

Director and will be responsible for coordination and technical management of their respective Components.

52. **Stakeholder Forum:** A Stakeholder Forum will be created to support the PMU and ensure engagement of key stakeholders from the public sector, private sector, NGOs and CSOs throughout the life of the project. Input and feedback obtained from the Stakeholder Forum will be used to inform implementation of the AIRBM. The Stakeholder Forum will serve as a platform to support the engagement of communities in project consultations, including consultations on the Basin Development Objectives for the Ayeyarwady Basin Master Plan. It is envisaged that the Stakeholder Forum will be sustained by the GoM after the Project.

B. Results Monitoring and Evaluation

53. **Monitoring and Evaluation (M&E):** The PMU will monitor progress against the agreed performance indicators in Annex 1 and produce quarterly progress reports. Data will be collected for each of the indicators with support from the DWIR, DMH and CMUs who will be responsible for monitoring technical progress. The PMU will produce the data for the results framework indicators on an annual basis as well as for the mid-term review and at project completion, and will discuss progress and performance related to the changes in these indicators from one year to another. During implementation, the PMU will recruit dedicated staff to monitor project progress and update the intermediary indicators. The PMU's M&E system will include all three project components. See Annex 3 for details.

54. The PMU will also carry out a mid-term review on or about about 30 months after credit effectiveness date to assess the status of the Project as measured against the performance indicators. Such a review would include an assessment of: (a) overall implementation progress of the Project; (b) results of M&E activities; (c) progress on procurement, disbursement and Financial Management (FM); (d) progress on the implementation of the Environmental and Social Management Framework (ESMF) and other safeguards measures; (e) implementation arrangements; and (f) need for any project restructuring or reallocation of funds to improve performance. The PMU will provide the WBG with a project progress report prior to the mid-term review with updated results indicators (as in Annex 1), project cost estimates, and plans for completion. This report will be reviewed with the WBG and NWRC PSC, approximately one month after its submittal, to help the PMU take measures required to ensure the efficient use of the resources and achievement of the Project Development Objective.

C. Sustainability

55. The long-term sustainability of the project's benefits depends largely on the design, introduction and effective functioning of institutional, regulatory and planning systems reforms in Component 1. The project therefore supports robust institutional reforms, provides the capital funds and technical assistance needed to effectively launch and enable the newly decreed NWRC agencies, and provide these agencies with the information systems needed to support decision-making for the sustainable use of the country's water resources. In addition the designs of Components 2 and 3 take into account the need for sustained capacity, recurrent budget support and demand for services (See Annex 3.)

V. KEY RISKS AND MITIGATION MEASURES

A. Risk Ratings Summary Table

Risk Category	Rating
Stakeholder Risk	Substantial
Implementing Agency Risk	
- Capacity	High
- Governance	High
Project Risk	
- Design	Substantial
- Social and Environmental	High
- Program and Donor	Moderate
- Delivery Monitoring and Sustainability	Substantial
Overall Implementation Risk	High

B. Overall Risk Rating Explanation

56. The overall implementation risk is considered “High” given Myanmar’s rapid pace of change and related pressure to develop the Ayeyarwady River without due regard for integrated and coordinated management, as well as the complexity of a multi-sectoral program that seeks to align and balance the interests of multiple stakeholders within government and outside. Weak capacity and issues of public trust regarding water development choices is expected to add another layer of complexity to project implementation.

57. Overarching country risks include the fragility of the reform process and the lack of government experience with WBG processes after a two-decade hiatus in engagement. More generally there appears to be a limited capacity and relatively weak institutional mechanisms to deliver the government’s ambitious reform programs and the large number of infrastructure projects in the pipeline. Limited capacity in procurement, FM, governance, fraud and corruption, and environmental and social safeguards also pose risks to the Bank’s engagement in Myanmar.

58. The main project risks relate to: (a) the ability to coordinate and integrate water management decisions across numerous stakeholder groups; (b) the fragmented institutional and regulatory environment around water management; (c) the lack of adequate data and physical access to carry-out basin-wide analyses; (d) the technical complexity of upgrading and utilizing a modern decision support and hydromet system; and (e) the difficulties faced by public institutions in recruiting and retaining a highly qualified work force particularly in the competitive ICT sector.

59. Capacity risks associated with procurement are "High". These risks, however, will be mitigated by supporting the development of adequate project management, procurement and financial management capacity to support implementation. Within the PMU, a full-time staff will be identified to undertake procurement functions. By using nominated government officials for procurement, greater ownership and accountability is expected for project implementation.

60. Capacity risks associated with FM requirements will be mitigated by ensuring there is a full-time Project Director to oversee the financial management processes, and by providing the PMU with ample consultant support and training for procurement and FM.

61. Environmental and social risks stem from the nature of the project and the weak technical capacity and institutional capacity of the implementing agencies to carry out and monitor safeguard policies and procedures. Government agencies have no previous or limited experience of preparing and implementing Bank safeguards policies. The potential impacts of not taking into account adequately environment and social effects into the development of the Integrated Master Plan, feasibility studies and subsequent investments can be significant. This risk will be managed through the ESMF as well as the range of capacity building activities in the project design and an institutional capacity and capacity building safeguards plan during project implementation.

VI. APPRAISAL SUMMARY

A. Economic and Financial Analysis

62. Significant economic benefits are expected to result from the project's investments in institutional strengthening, hydromet, forecasts and warnings systems enhancements, and navigation improvements. Investments under Component 1 (Water Resource Management Institutions, Decision Support Systems and Capacity Building) are expected to help the government make better informed investment decisions and avoid potentially significant losses associated with large-scale long-lived investments that have unintended consequences and/or foreclose better development options. In addition, the PFI component will increase the government's capacity to plan and prepare investments more efficiently and up to international quality standards, reducing the economic and social benefits foregone as a result of the delayed preparation or weak project design and appraisal. The benefits associated with this component, however, are difficult to quantify.

63. Investments under Component 2 (Hydro-meteorological Observation and Information Systems Modernization) are anticipated to accrue both from reduced disaster losses and enhanced productivity, particularly in agriculture. Strengthened weather forecast and warning systems will diminish damages from floods, storms and tsunamis that have accounted for seven of Myanmar's ten most devastating natural disasters, 99 percent of all deaths recorded from natural disasters and an average of over \$40 million in annual damages. Modernized hydromet systems can also significantly enhance economic productivity, particularly in agriculture which accounts for about 37 percent of GDP. To assess the economics, two methodologies were applied: (i) a global benchmarking methodology; and (ii) a sector specific/empirical methodology. Both indicated that this investment is economically attractive with benefit-cost ratios, ranging from 2.7 to 28.6.

64. Investments under Component 3 (Navigation Enhancement on the Ayeyarwady River) are also anticipated to provide strong returns. The most detailed information available on this issue is a study by Royal Haskoning (1988) that indicated that an investment in channel enhancements and night navigation (similar to those in this Project) would yield a financial internal rate of return of 30.1 percent and an economic internal rate of return of 29.3 percent. A detailed economic analysis of specific design options will be undertaken during implementation, but the strong returns on investment that were initially estimated for these interventions, coupled with the recent JICA-financed Transport Study suggesting a five-fold increase in freight traffic over the coming 15 years, suggests these investments should provide strong economic returns.

B. Technical

65. The project's technical design builds on global good practice, experience gained during project preparation and expert judgment. Project preparation was carried out with the participation of a range of experts from the GoM, academia and civil society organizations in Myanmar, as well as international expert consultants, experts from the governments of the Netherlands and Australia, and the World Bank.

66. As recommended by the WBG's Water Resources Sector Strategy the project combines investment in institutions (to ensure the efficiency, effectiveness and sustainability) with investments in infrastructure (to deliver tangible benefits). Appropriate international expertise was engaged to ensure that the proposed approach to develop a basin planning framework (including a knowledge base and decision support systems), the proposed improvements in the hydro-meteorological network and related information systems and services, and the proposed navigation enhancements all conform to international good practice adapted for the Myanmar context. In particular, the hydromet modernization program was designed specifically to conform to best practices established by the WMO, which is the intergovernmental body responsible for coordinating the international exchange of information needed to maintain and improve weather, water and climate services.

C. Financial Management

67. Financial management arrangements will be aligned with the implementation arrangements described above. Financial management responsibilities will be centralized in the PMU under the management of the AIRBM Project Director. The financial management system for the project will use the Government's systems as far as possible, building on the DWIR/NWRC financial management system with appropriate enhancements as needed. In addition, a PIM has been drafted that includes procedures and controls for financial management for the project.

68. An assessment of FM arrangements was conducted based on the guidelines issued by the FM Sector Board, as stipulated in OP/BP 10.00. The overall financial management risk is assessed as "Substantial". The main risks that need to be addressed include: (a) inadequate documentation of policies and procedures (although the manual systems of internal control themselves are reasonably strong); (b) likelihood of delays and arithmetic errors due to the fact that all processes are manual rather than computerized; and (c) inexperience with managing and

implementing Official Development Assistance projects. Mitigation measures proposed are: (a) having in place an acceptable PIM with an FM section for the project; (b) appointing a full-time qualified and experienced finance staff for the project, with support of a qualified financial management consultant (particularly in the initial project implementation phase to set up the FM system and build capacity of the DWIR/NWRC finance staff); (c) training in project financial management for all staff involved in the project; and (d) having the project financial statements externally audited on an annual basis.

D. Procurement

69. The overall procurement risk is rated as "High". Currently, Myanmar does not have complete national level legislation on public procurement and no official procedures in writing exist within MOT. This creates a risk of confusion as to the procedures and rules to be followed under implementation of this project. To address this risk, the team has clarified and agreed with MOT that the project will strictly follow the World Bank Procurement/Consulting Guidelines.

70. The procurement experience of all of the implementing agencies is limited. This will be the first time these agencies conduct procurement in accordance with international practice. Following an assessment of the existing procurement practices of the implementing agencies, risks and deviations from the World Bank Guidelines were identified. The details are in Annex 3 Implementation Arrangements.

E. Social (including Safeguards)

71. The project is expected to have positive social benefits for men, women, minors and vulnerable groups by: (a) enhancing water resources management thereby contributing to the delivery of more reliable and better quality water to all users; (b) strengthening disaster risk management efforts related to flood, drought and storms by improving predictions of the timing and severity of weather extremes and delivering more effective warnings; (c) helping vulnerable communities, particularly those living in flood prone areas, preparing for and coping with hydrological related natural disasters; and (d) enabling safer, more efficient inland water transport.

72. An ESMF was developed to: (a) identify social risks and potential social impacts and opportunities; (b) provide for the preparation of appropriate safeguard measures and plans for managing and addressing impacts; (c) assess risks associated with respective activities, address data gaps that have to be filled, and provide measures to mitigate risks and impacts and enhance benefits; and (d) provide stakeholder engagement through public consultation forums and promote communications and outreach. The ESMF also describes processes and procedures for a Strategic Environmental and Social Assessment (SESA) which will be carried out during project implementation under Component 1 as an input to the Ayeyarwady River Basin Master Plan and Decision Support System. The SESA will seek among other things to highlight issues of concern surrounding potential future hydropower development and indicate areas of particular environmental sensitivity and social fragility. This will be done with the understanding that any future hydropower development or other future investments would need project specific screening and assessment as contained in the ESMF.

73. **Gender.** Vulnerability to weather-related hazards is a particular concern in Myanmar and one that disproportionately affects women and children. Globally, Save the Children has found that women and children are up to 14 times more likely to die in natural disasters than men. The Post-Nargis Joint Assessment of 2008 found that 61 percent of those who died during the cyclone were female and in some severely affected areas twice as many women aged 18-60 died as men. Moreover gender norms and practices limit opportunities for women to obtain access to essential information, including both disaster warnings and agricultural advisory services. In order to promote equity and leverage the positive impacts, gender concerns will be integrated in this project. Efforts will be made to reach out to women in the design and implementation of activities relating to disaster warnings and agricultural advisories, and capacity building opportunities will be provided for both males and females. In particular, the Project will seek to: (a) integrate gender dimensions in the key assessment and planning exercises including the Ayeyarwady River Basin Master Plan and the Strategic Environmental and Social Assessment (SESA); (b) integrate gender aspects in the implementation of the Stakeholder Forum and all communications and outreach activities including the dissemination of disaster warnings and agricultural advisories; and (c) ensure that male and female staff of relevant agencies and communities have equal opportunity to participate in the capacity building and training sub-components of the Project.

74. **Indigenous Peoples (OP/BP 4.10):** The Ayeyarwady basin is home to diverse groups of ethnic minorities who are dependent on the river for livelihoods and subsistence; the river traverses Kachin *ethnic state*. OP/BP 4.10 is therefore triggered. Component 3 dredging work may result in economic disruptions, mainly of a temporary character. In addition, Component 2 hydromet modernization activities and Component 1 studies, which will be undertaken to support the Ayeyarwady River Basin Master Plan as well as financed through the PFI, may be implemented in areas where ethnic minorities are present. An Indigenous Peoples Planning Framework (IPPF) was developed as part of the ESMF to provide for culturally appropriate benefits, mitigation measures and mechanisms to ensure the meaningful participation of ethnic minorities in the Project. Indigenous Peoples Plans (IPP) will be developed as necessary during implementation for site-specific activities where ethnic minorities are present based on a social assessment and free, prior and informed consultations with ethnic minorities when the exact scope and scale of project activities become known. The SESA, which will provide inputs for the development of the Master Plan and Decision Support System, also triggers the Indigenous Peoples Policy and will assess among other things issues, risks, impacts and opportunities concerning ethnic minorities, and engage them and their organizations in assessment and consultation activities.

75. **Involuntary Resettlement (OP/BP 4.12):** While the overall project impact is expected to be positive, civil works to be financed under Components 2 and 3 could affect people who use the Ayeyarwady riverbanks, and potential investments examined under the Preparation of Future Investments (Component 1) may involve future land and other property loss. The ESMF includes a Resettlement Policy Framework (RPF) to address any land acquisition and other involuntary resettlement impacts that may arise once detailed project activities are identified during project implementation. Should land and other property loss occur for site-specific project activities, Resettlement Action Plans will be prepared to ensure that affected people receive

compensation at replacement value according to OP/BP 4.12 and as outlined in the ESMF. This compensation will be provided from the Government budget.

F. Environment (including Safeguards)

76. The overall impact of the proposed Project is anticipated to be positive, but it is considered Environmental Assessment (EA) category “A” in accordance with OP/BP 4.01 namely due to its spatial extent, its focus on integrated river basin planning and the assessment of subsequent infrastructure investments (Component 1) and the civil works to be carried out under Components 2 and 3. Proposed interventions under Component 3, such as dredging and civil works, may generate site-specific environmental impacts and changes in river flow and sediment flux. The significance of these impacts will be determined in the Environmental Assessment although they may be effectively prevented or significantly reduced through good detailed design and the application of appropriate actions to be specified in the ESMPs and incorporated in bidding documents for the works contracts.

77. The project will finance infrastructure investments only on selected sections of the Ayeyarwady River, but the area of impact of the project needs to encompass the effects of the broader Program of investments that might include activities identified under the Master Plan and developed using the PFI (both under Component 1). Consequently, the project area of impact is the entire Ayeyarwady River Basin and inter-linkages among different planned investments (e.g., by DWIR with own funds or from other development partners) should be acknowledged, adverse impacts including possible cumulative effects analyzed, and integrated mitigation measures proposed, monitored and reported promptly during project implementation.

78. Because technical details and the locations of the main infrastructure investments were not known prior to project appraisal, an ESMF (applicable to all project components) was developed by the DWIR/NWRC Secretariat. The ESMF provides the overall ESIA process and safeguards policy requirements to be undertaken during project implementation once specific project interventions are known. It provides for how to screen and assess project activities for potential impacts and to implement measures to effectively address them during project implementation, while ensuring compliance with the existing environmental protection laws, regulations and standards in Myanmar, as well as with the World Bank’s Safeguards Policies. The PMU will be responsible for implementation of the ESMF and its provisions, whereas the day-to-day management of the prevention/mitigation activities will be overseen by the CMUs. All safeguards instruments prepared during implementation, including the ESIA reports and site specific ESMPs for civil works prepared in line with the respective detailed designs will be reviewed by the Bank prior to issuing the tenders for the works.

79. The ESMF public consultations included two sets of public meetings, one at the Terms of Reference and the other at the draft ESMF stages. The documents were disclosed in country in Myanmar language and in English, and through the World Bank InfoShop in English before project appraisal. The first set of consultations on the ESMF TORs was held in Mandalay and Yangon on May 16 and May 19, 2014 respectively. A second round consultation took place on September 18-19, 2014. The consultations were well attended, informative and constructive (see Annex 3 for more details).

80. **Environmental Assessment (OP/BP 4.01):** The overall environmental impacts of the project are expected to be positive. The impacts from the construction of a NWRC Secretariat and Hydro-Informatics Center headquarters facility in Mandalay and the refurbishment of offices in Yangon and Nay Phi Taw (Components 1), small civil works on the hydro-meteorological observation system linked to the modernization and installation of monitoring stations (Component 2) are expected to be limited. River engineering works (Component 3) may cause adverse environmental and social impacts. Planned channel enhancements (to increase the 'least available depth' of the river during the low flow season) are likely to involve the construction of groins within the riverbed that will serve to concentrate the dry season flow into a narrower and hence deeper section of the river bed in order to facilitate safe ship passage. Although modeling and the environmental assessments have yet to be done, construction-related environmental impacts are anticipated to be localized, temporary, and efficiently mitigated by applying good international construction practice and planning. However, these activities may impact downstream water quality and turbidity, aquatic habitats, aquatic flora and fauna, fishery, primary productivity and users of the river. Transport and disposal of dredged materials will also have impacts, and the works may have impacts on navigational traffic and safety. Limited dredging is anticipated to enable the construction of groins, whose number and location will be determined based on 2-dimensional modeling results. Unexploded ordinance clearance works are not expected but if required they will be implemented in line with specific international standards of operations. During implementation, before channel enhancements works begin, a detailed design and ESIA will be carried out and impact mitigations measures will be outlined in site specific ESMPs.

81. To support the development of a long-term basin-wide Master Plan and Decision Support System, a SESA will be prepared during project implementation (under Component 1). A preliminary draft TORs for the SESA is annexed to the ESMF. Furthermore, the River Basin Management Plan will contain the basic environmental and social data collection and mapping such as biodiversity areas, aquatic habitats, riparian habitats, water quality, river and riparian uses, livelihoods dependencies including the presence of ethnic minorities. Environment and social risks and potential impacts will be taken into account in all development scenarios. A TOR of the River Basin Management Plan will be provided at the beginning of project implementation to the Regional Safeguards Secretariat. It will identify in detail the scope of the different environment and social aspects to be taken into account in the River Basin Management Plan. It will also indicate how the Strategic Environmental and Social Impacts Assessment (SESA) will be integrated into the River Basin Management Plan and how regional and cumulative effects will be taken into account. The environment and social content of the TOR for the River Basin Management Plan will also be reviewed and cleared by the Regional Safeguards Adviser.

82. The PFI will support the preparation of feasibility and other studies for investments that may be implemented in future phases of this program or financed by others. These potential future investments (i.e., irrigation and drainage, flood control, hydropower, navigation, delta management, municipal water supply, and municipal wastewater) are likely to have potential adverse environmental and social impacts. The Terms of References (TORs) of studies will include screening of environmental and social safeguard risks, impacts and issues based on the

ESMF and relevant World Bank safeguard policies. In cases where the river basin planning process identifies priority investments for which feasibility studies and/or designs will be prepared by the project, ESIA and other safeguard instruments (e.g. RAPs, IPPs), as needed, will be prepared in accordance with the ESMF and Bank safeguard policies.

83. **Public Consultations and Information Disclosure:** Consultations have been undertaken with key Ministries, relevant Parliamentary committees, the River Users Association, NGOs and CSOs with interests in water, environment, natural resources management and disaster risk management, including consultations and public disclosure regarding the ToR for the preparation of the ESMF in May 2014 and the draft ESMF in September 2014. The ESMF has been finalized subsequent to the public consultations and describes the issues raised and how they have been responded to and addressed (see Annex 3 for more details). The ESMF includes measures for consultation and public disclosure during project implementation, including particular measures for consulting with ethnic minorities as described in the IPPF for site-specific activities in areas with ethnic minorities. Moreover, the SESA includes a consultation process to engage all relevant stakeholders, including ethnic minorities, in the preparation of the Master Plan. The draft ESMF was submitted to the Bank's Infoshop on August 13, 2014 and, after translation, it was publicly disclosed in Myanmar language and English on September 4, 2014 prior to consultations held in Yangon and Mandalay on September 18 and 19, 2014. The final English version of the ESMF was disclosed on October 24, 2014 in the Bank's Infoshop, and both the final English and Myanmar language were disclosed in the DWIR website on October 27, 2014. Intermediate drafts were also disclosed prior to the disclosure of the final ESMF.

84. During implementation, any Bank-financed subproject that requires a safeguard instrument such as an ESIA, RAP, or IPP, will follow Bank operational policy rules for disclosure and public consultation. For any identified Category A subproject financed under the project, the Executive Summary will be submitted to the World Bank Board for information and consultation at least 120 days prior to the start of subproject works contracting.

85. Any investments prepared under Component 1.3 (Preparation of Future Investments) that require a safeguard instrument such as an ESIA, RAP, or IPP, will also follow Bank operational policy rules for disclosure and public consultation. However, these investments will not be financed under the project but will potentially be considered in future Bank-financed projects under the proposed "Series of Projects." Any new projects will need to be approved by the World Bank Board and will need to follow all relevant Bank policies including safeguards, procurement, financial management, etc.

86. **Physical Cultural Resources (OP/BP 4.11):** The project will carry out limited civil works under the channel enhancements and hydromet modernization sub-components. As a consequence, no Physical Cultural Resources (PCRs) impacts are anticipated. Nonetheless, given Myanmar's rich cultural heritage there is a possibility that PCRs could be unearthed or affected. However, projects included in the sub-component for preparation of future investments, such as irrigation and hydropower, may affect physical cultural resources and the SESA will consider physical cultural resources. The ESMF therefore includes a PCRs assessment and mitigation section including "Chance Finds Procedures". If appropriate, a PCRs Management Plan will be

developed to provide detailed mitigation measures.

87. **Natural Habitats (OP/BP 4.04):** The policy is triggered on the one hand because of the project's positive impact on diverse natural habitats within the basin through the creation of a decision support system to better manage the basin's water resources. At the same time, however, the project activities may also have negative impacts on natural habitats. Specifically, channel enhancement works may affect aquatic and riparian habitats. The ESMF will be used to screen potential project impacts on natural habitats and provide for how they should be addressed during project implementation.

88. **Forests (OP/BP 4.36):** No activities financed under this Project (the first phase of the series of projects envisioned) are anticipated in forest areas. However, projects included in the sub-component for preparation of future investments, such as irrigation and hydropower, may affect forest areas and the SESA will consider potential effects on forests. The policy is therefore triggered to ensure that the projects being prepared under the PFI include the necessary due diligence to ensure that the objectives and requirements of OP 4.36 are met.

G. Other Safeguards Policies Triggered

89. **Projects on International Waterways (OP/BP 7.50):** The Ayeyarwady rises in the Himalayas, bisects Myanmar from north to south and empties through a nine-armed delta into the Bay of Bengal. A portion of the catchment areas that feed two of the tributaries of the river (the Maykha and the Malikha) are located in China. The Malikha tributary in turn is fed by a sub-tributary originating within India. This meets the definition of an International Waterway as stipulated in paragraph 1 of the World Bank's Operational Policy 7.50 on International Waterways, although the combined flow outside of Myanmar is estimated to be less than 1 percent. The planned investment activities involve minor additions or alterations to an ongoing scheme of river training and protection, feasibility studies for potential future investments in the river basin and water resource/groundwater surveys. Although modeling and the environmental assessment have yet to be done, it is not anticipated that the construction or rehabilitation works proposed under the project will adversely change the quality or quantity of water flowing in the river and the project will not be appreciably affected by other riparians' possible water use. On this basis, the Bank has determined that the proposed project does not require riparian notification in accordance paragraphs 7(a) and 7(b) of OP 7.50.

90. **Safety of Dams (OP/BP 4.37):** While the project itself will not finance construction or rehabilitation of new or existing dams, the PFI may provide funds for the preparation of infrastructure projects including dams. This policy is therefore triggered to ensure that the projects being prepared under the PFI include the necessary due diligence to ensure the safety and integrity of dams.

91. **Pest Management (OP/BP 4.09):** the project activities are not expected to use or finance pesticides, or lead to increased usage of pesticides. However, this policy will be screened in future investments (PFI subcomponent) and appropriate instruments (e.g., Integrated Pest Management Plans) would be prepared as needed.

Annex 1: Results Framework and Monitoring

Country: Myanmar

Project Name: Ayeyarwady Integrated River Basin Management Project (P146482)

Results Framework

Project Development Objectives

PDO Statement

The program development objective for the Series of Projects (of which the AIRBM will be the first) is to strengthen integrated, climate resilient management and development of the Ayeyarwady River Basin and national water resources.

The project development objective of the AIRBM is to contribute to the development of integrated river basin management on the Ayeyarwady River.

These results are at | Project Level

Project Development Objective Indicators

Indicator Name	Baseline	Cumulative Target Values										
		YR1	YR2	YR3	YR4	YR5	YR6	YR7	YR8	YR9	End Target	
Component 1: River Basin Master Plan (Yes/No)	No					Yes						Yes
Component 1: Preparation Studies (Number)	0.00											2.00

Component 2: Hydro-Met Stations Functioning per SOP (Percentage)						90.00					90.00
Component 2: Hydro-Met Products (Number)	0.00					3.00					3.00
Component 3: Navigation Improvements (Percentage)	0.00					90.00					90.00

Intermediate Results Indicators

Indicator Name	Baseline	Cumulative Target Values									
		YR1	YR2	YR3	YR4	YR5	YR6	YR7	YR8	YR9	End Target
Component 1: River Basin Master Plan - Phase 1 Report (Yes/No)	No		Yes								Yes
Component 2: Hydromet System Design (Yes/No)	No		Yes								Yes
Component 3: Navigation Detailed Design (Yes/No)	No		Yes								Yes

Component 1: Decision Support System (Yes/No)	No					Yes					Yes
Component 2: Hydromet Stations Upgraded (Percentage)	0.00					100.00					100.00
Component 2: Hydromet System Financial Sustainability (Percentage)						90.00					90.00
Component 3: River works construction (Percentage)	0.00					100.00					100.00
Capacity building and gender (Number)	0.00					500.00					500.00
Capacity building - percentage of participants female (Percentage - Sub-Type: Supplemental)	0.00										40.00

Indicator Description

Project Development Objective Indicators

Indicator Name	Description (indicator definition etc.)	Frequency	Data Source / Methodology	Responsibility for Data Collection
Component 1: River Basin Master Plan	Comprehensive water resources management plan for the basin.	Annually	Monitoring reports	PMU with CMU 1
Component 1: Preparation Studies	Number of preparation/feasibility studies for priority investment projects identified under the Master Plan and selected for PFI support that are successfully completed.	Annually	Monitoring reports	PMU with CMU 1
Component 2: Hydro-Met Stations Functioning per SOP	Percentage of hydro-met stations operating with “Standard Operating Procedures” as defined by System Integration Consultant and agreed with DMH.	Annually	Monitoring reports	PMU with CMU 2
Component 2: Hydro-Met Products	Hydro-met products for water resource planning, agriculture, and disaster risk management products evaluated on average as at least “moderately satisfactory” by sector end users through a user satisfaction survey.	Annually	Monitoring reports	PMU and CMU 2
Component 3: Navigation Improvements	Percentage length of river navigation channel enhanced to desired operating standard as identified by Navigation Design/Feasibility Study	Annually	Monitoring reports	PMU and CMU 3

Intermediate Results Indicators

Indicator Name	Description (indicator definition etc.)	Frequency	Data Source / Methodology	Responsibility for Data Collection
Component 1: River Basin Master Plan - Phase 1 Report	The rapid assessment phase completed and first set of priority projects identified.	Annually	Monitoring reports	PMU with CMU 1

Component 2: Hydromet System Design	Detailed design for the upgrade of hydromet system: upgrade of hydromet stations, communication systems, ICT systems, data processing, and forecasting	Annually	Monitoring reports	PMU and CMU 2
Component 3: Navigation Detailed Design	Detailed design for navigation improvement works completed.	Annually	Monitoring reports	PMU with CMU 3
Component 1: Decision Support System	Functional decision support system including hydrologic, hydraulic, and water quality models coupled with GIS based user interface.	Annually	Monitoring reports	PMU and CMU 1
Component 2: Hydromet Stations Upgraded	Hydromet system components installed and functional per intermediate results indicator ii) above.	Annually	Monitoring reports	PMU and CMU 2
Component 2: Hydromet System Financial Sustainability	Percent of target budget and staffing, as identified in intermediate results indicator ii) above, necessary to sustain O&M of the hydromet observation and information system.	Annually	Monitoring reports	PMU and CMU 2
Component 3: River works construction	Percent physical progress of construction works for navigation works identified in identified in intermediate results indicator iii) above.	Annually	Monitoring reports	PMU and CMU 3
Capacity building and gender	Number of participants in project-financed capacity building activities.	Annually	Monitoring reports	PMU and CMU 1
Capacity building - percentage of participants female	No description provided.	Annually	Monitoring reports	PMU and CMU 1

Note 1: Since this is a framework project, the specific values for the PDO indicators will be defined in Year 3 during the first mid-term review and based on the planning studies identified as intermediate outcome indicators.

Note 2: The enhanced navigation infrastructure along the Mandalay - Nyaung Oo stretch will hopefully lead to increased navigation traffic. Data on navigation traffic will be collected and analyzed to the extent possible. However, there are many factors affecting navigation traffic beyond the control of the project and therefore the primary project development objective is to improve the navigation infrastructure.

Annex 2: Detailed Project Description

Myanmar: Ayeyarwady Integrated River Basin Management Project

1. The program development objective for the Series of Projects (of which the AIRBM will be the first) is to strengthen integrated, climate resilient management and development of the Ayeyarwady River Basin and national water resources.
2. In the first phase, the AIRBM has been designed to focus on the development of the institutions and tools needed to enable informed decision making in the management of Myanmar's national water resources and to implement integrated river basin management on the Ayeyarwady, while immediately enhancing the river's productivity with "low/no regrets" investments in the hydro-meteorological observation system and services (to support agricultural productivity and water-related disaster risk management) and in navigation enhancements (to promote sustainable transportation.) The project would also support a prompt and effective response to potential crises and emergencies.
3. These key early investments will lay the groundwork needed to undertake good practice water resources management and large-scale infrastructure investments, some of which could be included in future phases of this program.) It will provide the government with the capacity to do basin-wide scenario analyses, to properly identify and assess the complex trade-offs that inevitably arise from large long-lived water infrastructure investment, and to follow economic, environmental and social 'good practice'.
4. The program is envisaged as a multi-phased, overlapping Series of Projects. This structure was developed in recognition of the importance of building institutions and knowledge for long-term development, while at the same time demonstrating immediate benefits to the country. An overlapping structure will allow the preparation and launch of additional investment projects before the completion of this first Project. To facilitate a pipeline of investments some of which could potentially be funded by future phases of this Series of Projects, the AIRBM will deliver a rolling Master Plan for the Ayeyarwady Basin that will identify priority projects that align with the overall Basin Development Objectives and can be prepared without undue risk prior to the completion of the full Master Plan. This Project will also provide funding (under the PFI) for feasibility studies and related preparation activities to expedite the development of a pipeline of investments.
5. The project design includes three inter-related investment components plus a contingency component to allow for rapid reallocation of funds if emergencies arise.

Component 1: Water Resource Management Institutions, Decision Support Systems, and Capacity Building. (US\$32 million equivalent)

6. At this moment of rapid reform and investment it is important to ensure that Myanmar's water resources are well managed and, in particular, that a vision for integrated river basin management guides new investment in the Ayeyarwady basin rather than defaulting to ad hoc

investments that can undermine one another and irreversibly compromise the river's full sustainable economic, social and environmental potential. This component therefore seeks to provide the information, capacity and institutions required to enable government to manage and develop the country's water resources in a sustainable, integrated way as well as to identify, appraise and manage appropriate development opportunities in the Ayeyarwady River Basin specifically.

7. To enable integrated, sustainable management and development of Myanmar's water resources, the Government is promoting greater coordination across agencies involved in water resources management as well as strengthened institutions, laws and regulations, capacity and decision support tools. A 2013 Presidential Decree was therefore issued to create the National Water Resources Committee (NWRC). The NWRC have three pillars: (i) a Secretariat; (ii) a Hydro-Informatics Center (HIC); and (iii) an Expert Group. This component will help to further build these three new structures.

1.1 Institutional Development (US\$10.5 million equivalent)

8. Support will be provided to develop the facilities, processes and institutional, knowledge and legal capacities necessary to deliver the NWRC's mandate. A clear focus of the project will be a broadly based capacity building program integrated into the main knowledge and development activities. This sub-component will support:

(a) NWRC Headquarters building, office refurbishments and equipment. Offices are expected to be set up in three locations: Yangon, Nay Pyi Taw and Mandalay. This sub-component will support design and construction of a new NWRC Secretariat and HIC headquarters facility in Mandalay, immediate refurbishment of associated office space in Yangon and Nay Pyi Taw, and provision of office furnishings and equipment. Each office will serve a specific function as follows:

- In Yangon, office space will be identified at DWIR to serve as AIRBM administrative offices for the life of the project, and provide enhanced facilities for the NWRC Secretariat/DWIR thereafter. The AIRBM Project Management Unit (PMU) will be based in Yangon and will be responsible for overall project management, including financial management, procurement, communications and outreach. Office space will also be made available for the management of Components 1, 2 and 3 as needed. This location will facilitate liaison with the financial management and procurement staff of the DWIR and the World Bank, as well as local and international technical expertise and civil society groups. The project will finance the design and refurbishment/extension of this office space.
- In Nay Pyi Taw, office space will be identified to facilitate the executive functions of the NWRC such as formal NWRC Meetings and Project Steering Committee meetings. Proximity to the national governing agencies is essential for this purpose. In addition, these offices can be used by project staff and consultants to facilitate liaison efforts with other line Ministries located in Nay Pyi Taw. The project will finance the design and refurbishment/extension of this office space.

- In Mandalay, a new NWRC building will be designed and constructed. This purpose-built facility will serve as the main site of the NWRC Secretariat and the HIC. In the future it is likely to serve as the headquarters of an Ayeyarwady River Basin Organization, which has been called for by the Parliament. The building will also provide office space for consultants, convening space for the NWRC Expert Group and conference rooms. The government will provide land for the building and the project will finance the design and construction of the building.

(b) Institutional development and operations of the NWRC Secretariat, HIC and EG, including institutional, legal and regulatory reforms. This sub-component will provide incremental operating costs and technical assistance for development of the NWRC institutions, mandates, business plans, staffing strategies and operational procedures. It will also support institutional, legal and regulatory reviews and reforms as appropriate. These might include support for: (i) development of the new Water Resources Strategy and Law together with a Water Framework Directive and associated regulations, implementation arrangements and enforcement mechanisms; (ii) a review of water management functions across the government and relevant environmental and social safeguards regulations and capacity strengthening to screen, review and monitor water-related investments for environment and social impacts; and (iii) rationalization of the institutional structure governing the management of water in Myanmar including support for the foreshadowed move to a River Basin Organization for the Ayeyarwady by assisting with the design of the Organization and the preparation of any necessary laws, regulations and guidelines.

(c) Capacity building for water resources management. This sub-component will finance tailored professional trainings in and out of country, MSc, PhD, secondary school curricula, workshops, exchanges/study tours, etc. Opportunities for twinning arrangements, across the government and Myanmar youth, will be explored. This capacity building sub-component could also support study tours by senior government officials as they work to design the proposed basin organization. The Government of the Netherlands is currently undertaking a Needs Assessment for integrated water resources management training in Myanmar which may be drawn on to prioritize activities for funding.

1.2 Ayeyarwady River Basin Master Plan and Decision Support System (US\$10 million equivalent)

9. This sub-component will provide immediate guidance on water resource investment options in the Ayeyarwady river basin while at the same time developing tools and processes needed to ensure the government has ongoing capacity to plan and manage its national water resources.

a) Ayeyarwady Integrated River Basin Master Plan and Decision Support System. A phased approach will be taken to plan integrated development of the Ayeyarwady River, based on sufficient understanding of opportunities and risks and guided by agreed Basin Development

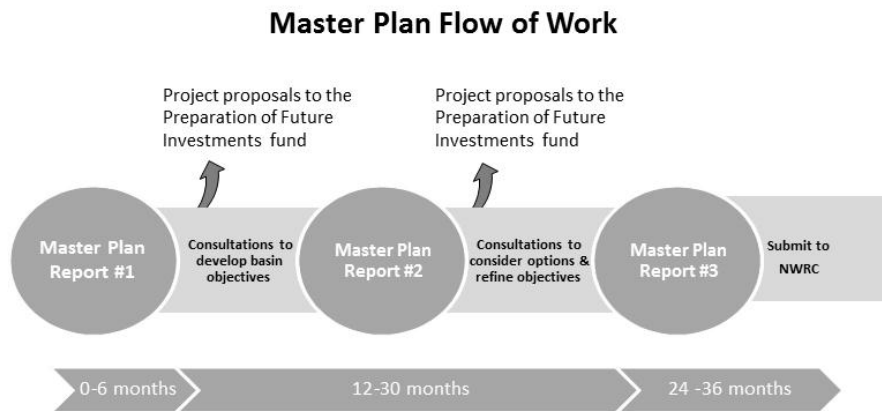
Objectives. An integral part of this activity will be the development of a Decision Support System (DSS) that will become the central knowledge asset of the Hydro-Informatics Center. Within the context of developing the Master Plan a stakeholder consultation process to engage government, academia, the private sector, NGOs/CSOs and local communities will be undertaken to identify Basin Development Objectives that will help guide the basin plan. The Stakeholder Forum (activity 1.4.c below) will provide a platform for this consultation.

- *A “rolling” Master Plan* will be developed to meet the dual objectives of ensuring both the robust analysis of basin-wide opportunities and the rapid preparation of appropriate projects. The Ayeyarwady River Basin Master Plan will develop in complexity and detail over the course of the Project. The initial Master Plan is to be available within 6 months of commencing the consultancy and this will be followed with an interim Plan at 20 months, a final Plan in draft form at 30 months and the completed Plan at 33 months. It will provide progressive information on management approaches and specific projects for the NWRC to consider based on information, modelling and the DSS as they become available. This information will also form part of a structured stakeholder engagement process designed to inform and receive feedback from the broader community.
- *The models and DSS* developed in this sub-component will enable the GoM and the NWRC to deliver the Master Plan and thereafter form the central knowledge base for the HIC. Activities will include: (i) a calibrated hydrological model of the Ayeyarwady River and its Tributaries, (ii) supporting spatial data bases including social, environmental and economic data at the appropriate scales, and (iii) hardware/software design, implementation and knowledge and skills transfer to the HIC.
- *Phase 1 Basin Master Plan: Rapid Basin Assessment, Basin Development Objectives & Initial Ayeyarwady Basin Master Plan.* To provide immediate guidance on ‘no regrets’ opportunities for development in the basin, Phase 1 Plan will be developed within the first 6-12 months of the project. To deliver this plan the following will be developed: (i) a “scoping level” model of the basin capable of broadly representing water based development pathways and demonstrating the opportunities and tradeoff from a basin perspective; (ii) Basin Development Objectives (BDO’s) and indicators for public consultations and NWRC consideration and endorsement that take due regard to the “precautionary” principle given that more detailed investigations and modelling will yield a more refined understanding of the Basin over the course of the project; and (iii) the Initial Basin Assessment/Phase 1 Basin Master Plan report that will provide a platform for discussion on the development potential of the Basin and likely consequences of the various development pathways as well as a set of specific projects or activities that are consistent with the initial BDO’s—a first set of “no-regret” investment opportunities that can be advanced to feasibility assessment.
- *Phase 2 Basin Master Plan: Intermediate Options Analysis.* The Phase 1 Plan will be progressively updated as data collection, modelling and DSS development advances and a second phase Master Plan will be developed in the second year of the project (12 to 24 months). Stakeholder engagement would be ongoing in this phase and is seen as fundamental to achieving the objectives of developing the knowledge assets, models and

DSS as well as a Basin Master Plan that is owned by the GoM and informed by stakeholder objectives and preferences. This phase will focus on presenting alternative options for medium-term development paths in the Ayeyarwady Basin as well as highlighting immediate investment opportunities that would not unduly constrain future options.

- Phase 3: Ayeyarwady River Basin Master Plan.* Building on the significant work undertaken in modelling and DSS development, against the background of the range of long-term basin-wide management and development options, and consistent with the BDOs developed agreed through the consultation process, a complete Ayeyarwady Basin Master Plan together with a 10-year investment plan is to be developed. This will be delivered during the third year (24 to 36 months) of the AIRBM. Deliverables will include: (i) the final Ayeyarwady River Basin Management and Development Plan; and (ii) completion of the models, DSS and knowledge base adequate to perform ongoing, adaptive basin planning in response to changing risks and opportunities including climate change.
- Training and Technology transfer.* When this sub-component is delivered: (i) the HIC staff should have received sufficient training so that they can independently and effectively access the knowledge base, operate and upgrade the models and DSS; and (ii) all knowledge assets created by consultants should have been progressively transferred to the HIC (i.e., models, data bases and DSS) accompanied by the appropriate training and user documentation to ensure that it can be utilized and maintained.

The phased outputs of this component, illustrated in the diagram below:



Two inter-related streams of work:

- Basin planning to identify basin risks and opportunities
- Consultations to define basin objectives

- b) Surveys and Equipment: This sub-component will provide funding for key basin-wide survey work and for the purchase of equipment required for the DSS developed in activity 1.2.a.
- Ayeyarwady Basin Groundwater Survey. The Ayeyarwady is believed to be endowed with significant groundwater resources that might be sustainably developed in particular to support drinking water supplies and agricultural activities in the Dry Zone. This analytical work will seek to understand the quantity, quality and distribution of groundwater in the Basin. Specifically, activities will include: (i) establishment of the sustainable yield of the groundwater system in a few critical areas (where development currently exists or is foreshadowed); (ii) technical recommendations relating to the legal and administrative frameworks necessary for the future management of groundwater resources; and (iii) technical recommendations on planning and development of a long-term monitoring program particularly in areas where further detailed studies are needed before groundwater resources are critically over-allocated. Outputs will include: (i) a detailed groundwater study to determine the extent, location, recharge and quality of groundwater available, particularly in the Dry Zone; (ii) targeted investigations to understand aquifer characteristics and likely sustainable yields to support the GoM as it makes strategic choices about development pathways; and (iii) groundwater quality assessment particularly as it relates to arsenic contamination.
 - Ayeyarwady Basin Sediment Survey. The sediment survey will assess the sources of sediment, their magnitude, and trends. Consideration will also be given to the sediment load already contained within the river system and its likely impact on future developments. The study will include an assessment of the current sediment delivery to the Delta together with a broad assessment of the likely impacts of change (both increases and decreases) and recommendations for any further work necessary to better understand sediment dynamics.
 - Equipment. The equipment needed for the DSS designed in activity 1.2.a will be financed under this sub-component.
- c) Strategic Environmental and Social Assessment (SESA). The Ayeyarwady is home to an extraordinary diversity of cultural communities as well as ecosystems, flora and fauna. To understand the environmental and social dynamics of potential development options and projects in the Ayeyarwady Basin, a SESA will be carried out. This will include a basin wide survey of significant ecosystems and habitats as well as the main river use and related livelihoods. The SESA will be developed in parallel with the Master Plan (1.2.a) and its three phases to provide environmental and social inputs to the Master Plan, for example by identifying areas of the basin that are particularly fragile from an environmental or social perspective. In addition, the information and analysis generated in the SESA process will be captured in the DSS to ensure its integration in future planning and monitoring activities. The SESA will be participatory - designed to give voice to affected peoples - and developed in close tandem with the Stakeholder Forum consultation and other participatory mechanisms.

1.3 Preparation of Future Investments (PFI)) (US\$7 million equivalent)

10. This sub-component will support preparation activities for priority investments that may be financed under future phases of this Series of Projects. It will finance feasibility studies, procurement and safeguards related activities, workshops and study tours and other activities as agreed between the WBG and GoM. It will not finance detailed design work. This financing will create an incentive to develop projects within the NWRC framework – to identify, and prepare projects to international quality standards, within an integrated basin framework and in accordance with basin wide development objectives. To be eligible for PFI funding, a project must be consistent with the Ayeyarwady Basin Master Plan (Sub-component 1.2.a) and with the Bank’s engagement objectives in Myanmar.

1.4 Implementation Support (US\$4.5 million equivalent)

11. This sub-component will support the PMU to manage the overall project as well as supporting the Component 1 CMU. Specifically, it will provide funds for technical coordination, financial management, procurement, social and environmental safeguards compliance, monitoring and evaluation, training, communications and outreach, and administrative/secretarial support.

12. This sub-component will also support the creation of a Stakeholder Forum and Communications efforts. Activities will promote communications and outreach for both AIRBM specific concerns as well as for long term development and management of the Ayeyarwady River. Given the importance, sensitivity and reach of impacts associated with water management decisions, communications and outreach are essential to the success of the Project. In particular, it will be important to have a robust consultation mechanism in place to engage civil society in the development of the Water Law and the BDOs of the Ayeyarwady River Basin Master Plan.

Component 2: Hydro-meteorological Observation and Information Systems Modernization (US\$ 30.15 million equivalent)

13. The objective of this Component is to improve the quality of weather, climate and hydrological information and services in Myanmar. The project will increase the capacity of the DMH to provide information and services for disaster risk management, water resources management, agriculture, transport, environmental protection and other sectors.

14. The DHM includes the National Meteorological Service and National Hydrological Service of Myanmar. Its role includes observing and understanding weather, climate and water resources as well as providing meteorological, hydrological and related services in support of national needs, including water resources management, transport safety, food security, protection of life and property, safeguarding the environment, contributing to national security and sustainable development and promoting capacity building. It also contributes to national, regional and international cooperation.

15. Challenges for DMH include expanding and sustaining its meteorological and hydrological observing networks and properly integrating assets acquired through many different ODA projects – Doppler radar, numerical weather prediction (NWP), surface observations –

which requires staffing and financial support beyond the current limits. A high priority is providing early warning of meteorological and hydrological hazards.

16. DMH participates in a number of internationally funded programs and activities most of which are related to developing weather, climate and early warning systems. Hydrological observation and decision support systems so far have received much less attention. At present there is no unit or mechanism to coordinate internationally funded projects. Japan (JICA) is the largest donor in the sector supporting two programs with DMH: development of “end-to-end” early warning systems in pilot areas in the Lower Ayeyarwady River Basin and a project to establish a Disastrous Weather Monitoring System. The latter is by far the most significant and challenging project funded by the donors with DMH participation. It includes supply and installation of three S-band Doppler radars with towers and 30 automatic weather stations (AWS). Norway is providing significant support for digitizing Myanmar’s climate records, that exercise should be completed by the end of 2014. Norway is also supporting, through the Asian Disaster Preparedness Center, the introduction and pilot operation of the Weather Research and Forecasting model, upgrading of DMH’s Web-portal, and training and capacity building.

17. This Component will improve the quality of DMH services by providing (a) a stronger institutional and regulatory framework, (b) modernizing the observing and forecasting infrastructure, and (c) enhancing the services DMH delivers.

2.1 Institutional and Regulatory Strengthening, Capacity Building and Implementation Support (US\$6 million equivalent)

18. This subcomponent aims to strengthen DMH’s legal and regulatory framework, improve its institutional performance as the authoritative provider of weather, climate and hydrological data and information for Myanmar, build capacity of its personnel and management, ensure operability of the future networks and systems, support project design and implementation, and provide support to DMH for operations and service delivery. There are three parts:

- (a) Institutional strengthening and development of a legal and regulatory framework, which includes: (i) DMH institutional development and strategic planning, development of a legal and regulatory framework for DMH operations including development of standard operating procedures (SOPs), new business models, and client satisfaction surveys; and (ii) twinning support to enable DMH to work closely and sustainably with more advanced National Meteorological and Hydrological Services and the WMO.
- (b) Capacity building and training, which includes: (i) developing and implementing a DMH capacity building and training program consisting of DMH personnel training and retraining, professional orientation for DMH senior staff, study tours, education at universities, and training in WMO Regional Training Centers; and (ii) implementing training activities (workshops, round tables, etc.) for major users of DMH services (e.g., disaster management, agriculture, water resources, energy, health, surface transportation and civil aviation). DMH will ensure equal opportunities for male and female staff and representatives of other agencies to attend trainings and capacity building activities under this component.

- (c) Systems design and integration, component management and monitoring, which includes: (i) detailed design of the DMH systems, support for procurement and support for implementation (Systems Integrator Consultant); (ii) project management, monitoring, reporting and evaluation of subcomponents 2.1, 2.2, and 2.3; and (iii) assistance to DMH with its operational systems and in the development of new services.

2.2 Modernization of the Observation Infrastructure, Data Management Systems and Forecasting (US\$17.1 million equivalent)

19. This subcomponent focuses on improving the DMH meteorological and hydrological analysis and objective forecasting system. It aims to upgrade the objective forecasting platform with modern visualization tools that enable forecasters to overlay data and information from various sources. The subcomponent will modernize the DMH observation networks, data communication and IT systems. It will also provide dedicated NWP support enabling analysis of global and regional deterministic and ensemble models products and the capability to integrate these models into local NWP and hydrological modeling as required. The objective forecasting platform will be linked directly to the service delivery platform, developed as part of activity 2.1c. The system will allow for future development of NWP, hydrological modeling and forecasting capabilities. This subcomponent has four parts:

- (a) Technical modernization of the observation networks, which includes: (i) expansion, rehabilitation and technical re-equipment of the hydrological and sediment network including the field communications network; (ii) improvement of the sites of the hydrological stations (bank stabilization, improvement of flow conditions, engineering works, etc.); (iii) special equipment for hydrological stations (current meters, Acoustic Doppler Current Profilers, suspended sediment samplers, laboratory equipment, training, staff gauges, boats); (iv) regular upper air observations at two sites (including expendables for three years); (v) expansion of the automated surface observing system for aviation safety at several airports; (vi) expansion and upgrade of the surface meteorological and lightning detection network (automated weather stations, creation of climate reference network, rain gauge network, lightning detection network, wind profiling, power supply, field communication, etc.); (vii) expansion of the agrometeorological observing network; (viii) establishment of DMH calibration and engineering laboratories; and (ix) purchase of vehicles to support DMH field operations, maintenance and inspections. The modernized observation networks must be capable of being fully integrated with any existing observing systems.
- (b) Modernization of data management, communication, IT and forecasting systems, which includes: (i) communications and computer equipment to improve network communications and support the objective forecasting requirements (workstations for each forecasting bench) with capacity to overlay and manipulate data from national and international sources (WMO Information System WMO Regional Specialized Meteorological Centers, WMO global centers, national radar network, satellite data, numerical model products); (ii) data management systems capable of fully integrating all sources of data including existing and future national observing networks; (iii) remote sensing, GIS laboratory including high resolution image capture and high performance workstation; and (iv) an objective forecast verification system.

- (c) Improvement of numerical weather prediction system and hydrological modelling systems capable of retrieving and analyzing numerical products from various sources (WMO global and regional centers) and utilizing these products for local prediction. This includes: (i) computers, software for numerical weather and climate prediction and hydrological modeling and analysis including downscaling and analysis of climate models; and (ii) training to provide numerical modeling specialists with the ability to analyze model products and provide guidance to forecasters on reliability of numerical tools for all weather, climate and hydrological events.
- (d) Reconstruction and refurbishment of offices and facilities, as needed to support the upgraded systems and expanded services.

2.3 Enhancement of Hydromet Service Delivery Systems (US\$7.05 million equivalent)

20. The objective of this subcomponent is to improve service delivery by strengthening the public weather service and public hydrological service functions of DMH by creating new information services, such as impact forecasts for vulnerable communities and the main weather dependent sectors of the economy. The main tasks are:

- (a) Create a Service Delivery Platform and improve weather and hydrological services for the public, DRM, water resources, agriculture, irrigation, media, civil aviation, navigation, health and energy, which includes: (i) developing, improving and operationalizing basic and specialized information services; (ii) improving service delivery to communities especially women and vulnerable groups through existing network of organizations as well as community radio and introduction of mobile applications; and (iii) developing and operationalizing assessments of forecast utility through public and sector specific surveys.
- (b) Support of Disaster Risk Management (DRM) operations including introduction of impact forecasting and expansion of “end-to-end” early warning system based on impact forecasts in several small river basins with floods and flash floods, which includes: (i) developing SOPs, warning protocols and signals agreed with all basin stakeholders including communities, operational training and drills with government stakeholders and communities especially groups that are vulnerable to disaster including women, children, the elderly and disabled; and (ii) introducing and pilot testing (jointly with DRM agency) impact forecasting techniques and warnings.
- (c) Development of an Agriculture and Climate Advisory Service (ACAS), which aims to provide critical, timely and reliable agro-climate and weather information to farmers in order to increase productivity and reduce losses from meteorological and hydrological hazards. This will include: (i) developing an ACAS Portal including provision of hardware and software; (ii) developing agriculture monitoring information products, dissemination of information products; and (iii) capacity building and training jointly with Ministry of Agriculture and Irrigation (MoAI) and Myanmar agricultural universities. This activity will be jointly implemented by MoAI and DMH. Collaboration among DMH, MoAI, universities and civil society working on food security and climate smart agriculture will be made on the ACAS to ensure effective outreach, dissemination of information and training to farmers especially women headed households and landless female farmers.

- (d) Creation and implementation of a National Framework for Climate Services, which includes:
- (i) supporting the development of a National Framework for Climate services for all stakeholders and support for sectoral Working Groups; and
 - (ii) developing a digital library of climate-relevant information for all sectors for Myanmar.

Component 3: Navigation Enhancement on the Ayeyarwady River (US\$37.85 million equivalent)

21. The Ayeyarwady River has historically been the main transport artery of the nation but the river's navigability is deteriorating. This deterioration appears to be caused primarily by heavy sediment loads. The annual estimated sediment load in the Ayeyarwady/Chindwin system is roughly 400 million tons making it the fifth most sediment laden river in the world. Sedimentation is perceived to be increasing as a consequence of natural processes as well as human activities such as mining and deforestation in the upstream watersheds. Impacts are seen in increasingly braided channels and sand bars that affect the river morphology and present hazards to inland transport, particularly at night when visibility is compromised and during the low water season (15 November to 15 May) when least available depth for navigation is marginal. The government has identified 46 points of constriction along the river that requires management intervention.

22. This component is designed to ease navigation constraints and thus improve the inland waterway transport in priority stretches of the Ayeyarwady River and design a cost-effective and environmentally and socially acceptable strategy for managing the full length of the navigation channel.

3.1 Navigation Improvements (US\$30.35 million equivalent)

23. River navigation improvements will be undertaken to ensure transport safety and efficiency particularly along the busiest section of the Ayeyarwady system which lies between Mandalay and Nyaung Oo (near Bagan). The present depth restriction for the Mandalay to Nyaung Oo section during the dry seasons is much less than the required 1.5 meters for proper navigation. Depth improvements will allow larger and more heavily loaded vessels to ply during dry seasons, increasing the efficiency of passenger and cargo transport.

24. This sub-component has been designed in partnership with the Dutch government who are financing a consultancy that will update the 1988 World Bank and UNDP-financed Irrawaddy and Lower Chindwin River Study on inland water transport, as well as identifying and providing detailed designs for the first phase of navigation improvements (activity 3.1.c) and recommending an operations and maintenance plan.

25. This sub-component will include the following activities:

- (a) Navigation channel modelling, detailed design and construction supervision: Three main tasks will be included in this activity:

- Task 1 - Navigation channel modeling: The 2-dimensional model financed by the Dutch government will be extended to cover the entire river section from

Mandalay to Yangon. The scope of works for river navigation enhancements, including the locations of the river training (groins) and bank protection works as well as the sections that require dredging, will be identified under this task. Targeted sedimentation modeling will also be developed under this Task to manage the sedimentation process along the enhanced channel from which a Maintenance Plan will also be prepared.

- Task 2 – Preparation of detailed design and bidding documents: based on the results under Task 1, detailed design document will be prepared for all the proposed enhancement works. The first phase of navigation enhancements works will focus on the Mandalay to Nyaung Oo section of the Ayeyarwady. Enhancements will likely include a series of groins, gabions and other minor river works not anticipated to have ‘over-bank’ impacts, as well as bank protection and dredging. This task would include: (i) preparation of detailed engineering design for the navigation enhancement works on the remaining Mandalay – Nyaung Oo section, including river training works, dredging and bank protection; (ii) design of navigation aids for full Mandalay – Yangon river section with 24-hour navigation focused for the Mandalay – Nyaung Oo stretch; (iii) estimation of the costs for the designed works and packaging for the bidding process; (iv) preparation of bidding documents for those packages; and (v) proposals for improvement works at some key inland ports. Detailed design for some most critical sections downstream of Nyaung Oo will also be included in this Task so the bidding process could start immediately if there are potential cost savings from bids for works under Mandalay – Nyaung Oo section.
- Task 3 - Construction Supervision: supervise construction for the entire enhancement works implemented.

(b) Preparation of ESIA/ESMP for navigation improvement works will be undertaken based on the scope of works identified under 3.1.a. Other safeguard plans, such as RAPs and IPPs, will also be prepared if needed following WB policies and the project ESMF.

(c) Construction of river navigation improvement works. This activity will include the implementation of enhancement works along the Mandalay – Yangon stretch and improvement of inland port infrastructures (if any, and subject to funds availability.) Enhancement works for first phase stretch of 30km near Mandalay will be implemented by the DWIR using the Force Account method.

3.2 Navigation Aids (US\$3.4 million equivalent): Mandalay to Yangon with night navigation focused on Mandalay – Nyaung Oo section.

26. Existing navigation aids are useful only for daytime navigation and need to be modernized to better meet the channel navigation demand. Most navigation aids are currently of a temporary nature, such as bamboo rods, and need to be upgraded to more permanent equipment such as metal buoys, some of which should be lighted for night navigation. Providing modern

navigation aids for the whole river section from Mandalay to Yangon, with night navigation aids focused on Mandalay to Nyaung Oo section and other safety and efficiency improvements, will enhance income generating opportunities for both inland water transport and green/river tourism businesses. This sub-component will include:

- (a) Purchase and installation of navigation aids: Bids will be invited to purchase and install the navigation aids designed under Activities 3.1.a above. Aids may include signage, buoys, lighting, mapping, a system of government river-pilots and a hopper-dredger (operated by the government or the private sector) for immediate response to river obstructions. Training for DWIR staff will be included in this contract to sustain the DWIR's capacity during the O&M stage.
- (b) Survey and pilotage services: Equipment, such as survey boats, echo-sounding equipment and radar will be purchased to support DWIR in undertaking survey work and providing routine pilotage services.

3.3 Water Quality Monitoring (US\$2 million equivalent)

27. Design and pilot operation of a surface water quality monitoring network. This sub-component will include the design and pilot operation of a water quality monitoring system for the Ayeyarwady River Basin. Currently, there is a lack of reliable and systematic information on surface and groundwater quality. There is a clear need to develop a legal and regulatory basis defining national goals, objectives and standards related to protection and evaluation of quality of water resources as well as to define institutional mandates and responsibilities including formulation of clear DWIR mandate and responsibilities for water quality monitoring. The sub-component will finance hiring of international experts to develop a program for water quality screening in the Ayeyarwady River basin and develop initial proposals for a pilot system. The screening will include: (a) clearly defined objectives, use of relevant WQ standards, selection of key physical, chemical and/or biological indicators; and (b) assessment of key river reaches and potential "hot" spots of potential high contamination or degraded ecosystems, during main seasons with low flow and high flow. The process will be supported by relevant quality assurance/quality control procedures of sampling, handling, and chemical and/or biological analysis and reporting. The reporting formats and evaluation techniques should be defined prior to the screening.

3.4 Institutional Strengthening and Implementation Support (US\$2.1 million equivalent)

28. This sub-component will include the following activities:

- (a) Institutional and implementation support. Technical assistance and incremental operating costs will be provided to support the CMU for Component 3 to manage and monitor this Component.
- (b) Fleet optimization study: The forecasted increase in traffic will require additions to the fleet even if river and port improvement are constructed and night navigation is introduced. This activity will help ensure that vessel designs are well suited to the river and optimize the

composition of the fleet in order to maximize the efficiency of the inland waterways transportation from a fleet development perspective.

(c) Capacity building, training and awareness raising. Training will be provided to government staff and river users where new signs, regulations and services are introduced. Communications and outreach to river users groups will be undertaken to raise awareness of the improvements made under this component. Gender considerations will be integrated in the training and communication/outreach to staff and river users.

Component 4: Contingent Emergency Response (US\$ 0 million equivalent)

29. Due to the high risk of catastrophic events in Myanmar, a provisional component is included in this Project to allow for rapid reallocation of funds in the event of a natural disaster or emergency. This 'zero component' (initially without any allocated funding) will allow funds from other components to be reallocated to provide emergency recovery and reconstruction support in the event of a natural disaster, emergency and/or catastrophic event. Funds potentially reallocated to Component 4 would be disbursed either against a positive list of critical goods and/or against the procurement of works, and consultant services required to support the immediate response and recovery needs of GoM. A Contingent Emergency Response Implementation Plan will be developed to guide financial management, procurement, safeguard and any other necessary implementation arrangements and procedures.

Summary of Activities and Costs

(All costs in US\$ Equivalents)

Component 1. WATER RESOURCES INSTITUTIONS, INFORMATION AND CAPACITY BUILDING		\$ 32,000,000
1.1	Institutional Development	\$ 10,500,000
1.1.a	NWRC Headquarters building, office refurbishments and equipment	\$ 6,000,000
1.1.b	Institutional development and operations of the NWRC Secretariat, HIC and EG	\$ 3,500,000
1.1.c	Capacity building	\$ 1,000,000
1.2	Ayeyarwady River Basin Master Plan and Decision Support System	\$ 10,000,000
1.2.a	Ayeyarwady Integrated River Basin Master Plans and Decision Support System	\$ 6,000,000
1.2.b	Surveys and equipment	\$ 3,000,000
1.2.c	Ayeyarwady Basin Strategic Environmental and Social Assessment	\$ 1,000,000
1.3	Preparation of Future Investments	\$ 7,000,000
1.3.a	Financing for feasibility studies, EIAs, SIAs	
1.4	Implementation Support/Project Management Unit	\$ 4,500,000
1.4.a	Consultant and advisory services to the Project Management Unit	\$ 2,500,000
1.4.b	Incremental operating costs	\$ 1,000,000
1.4.c	Stakeholder Forum and communications	\$ 1,000,000
Component 2. HYDROMET OBSERVATION AND INFORMATION SYSTEMS MODERNIZATION		\$ 30,150,000
2.1	Institutional and Regulatory Strengthening, Capacity Building and Implementation Support	\$ 6,000,000
2.1.a	Institutional strengthening and development of a legal and regulatory framework	\$ 500,000
2.1.b	Capacity building and training	\$ 2,900,000
2.1.c	Systems design and integration, component management and monitoring	\$ 2,600,000
2.2	Modernization of the Observing Infrastructure, Data Management Systems and Forecasting	\$ 17,100,000
2.2.a	Technical modernization of the observation network	\$ 9,250,000
2.2.b	Modernization of data management, communication, IT and forecasting systems	\$ 5,350,000
2.2.c	Improvement of numerical weather prediction system and hydrological modeling systems	\$ 1,900,000
2.2.d	Reconstruction and refurbishment of offices and facilities	\$ 600,000
2.3	Enhancement of Hydromet Service Delivery Systems	\$ 7,050,000
2.3.a	Creation of a Service Delivery Platform for weather and hydrological services	\$ 1,200,000
2.3.b	Support of DRM operations including introduction of impact forecasting and expansion of "end-to-end" EWS	\$ 1,600,000
2.3.c	Development of an Agricultural and Climate Advisory Service	\$ 2,900,000
2.3.d	Creation and implementation of a National Framework for Climate Service	\$ 1,350,000
Component 3. AYEYARWADY RIVER NAVIGATION ENHANCEMENTS		\$ 37,850,000
3.1	Navigation Improvements	\$ 30,350,000
3.1.a	Navigation channel modelling, detailed design and construction supervision	4,500,000
3.1.b	Preparation of EIA/ EMP for navigation improvement works	300,000
3.1.c	Construction of river navigation improvement works	25,550,000
3.2	Navigation Aids	\$ 3,400,000
3.2.a	Purchase and installation of navigation aids	2,200,000
3.2.b	Survey and pilotage services (survey boats, echosounding equipment, etc)	1,200,000
3.3	Water Quality Monitoring	\$ 2,000,000
	Design and pilot operation of a water quality monitoring system	2,000,000
3.4	Institutional Strengthening and Implementation Support	\$ 2,100,000
3.4.a	Implementation support	800,000
3.4.b	Fleet optimization study	500,000
3.4.c	Capacity building, training and awareness raising	800,000
Component 4. CONTINGENT EMERGENCY RESPONSE		\$ -
Project Total		\$ 100,000,000

Annex 3: Implementation Arrangements

Myanmar: Ayeyarwady Integrated River Basin Management Project

A. Project Administration Mechanisms

Project Institutional and Implementation Arrangements

- DWIR/NWRC Secretariat:** DWIR will be the implementing agency of the AIRBM and the Director General (DG) of DWIR will have managerial and financial oversight of the Project. The DG of DWIR also serves as the Secretary of the NWRC Secretariat which is a key agency in the Project. The Director General/Secretary's dual role should help to ensure coordination among different entities. These implementation arrangements are based on the evolving structure of the NWRC agencies but rooted in the existing organization and business processes of the DWIR.
- The AIRBM Project Steering Committee (PSC):** The NWRC will provide strategic guidance to the AIRBM and receive regular updates on progress. For purposes of immediate project oversight, an AIRBM Project Steering Committee (PSC) will be formed from the NWRC to review and advise on annual progress reports, work programs and key processes and outputs. The PSC will be chaired by the Deputy Vice Minister, MoT, and include three or four officials of the NWRC.
- Project Management Unit (PMU):** A PMU will be established under DWIR/NWRC Secretariat, and led by a Project Director. The Project Director will be responsible for project management and technical coordination, as well as procurement and financial management, monitoring and evaluation, and compliance with environmental and social safeguards for all project components. Financial management and procurement functions will be undertaken by existing staff of DWIR, with additional support from consultants to be hired under the project as needed. Project funds will be made available for the required equipment and incremental operating costs, as well as for recruitment of staff to support: (i) technical coordination; (ii) financial management; (iii) procurement; (iv) social and environmental safeguards compliance; (v) monitoring and evaluation; (vi) training, communications and outreach; (vii) translation; and (viii) administrative/secretarial support. The PMU and CMU offices will be located together in Yangon, with satellite offices at DWIR and DMH in Nay Pyi Taw.
- Stakeholder Forum:** A Stakeholder Forum will be created to support the PMU and ensure engagement of key stakeholders from the public sector, private sector, NGOs and CSOs throughout the life of the project. Input and feedback obtained from the Stakeholder Forum will be used to inform implementation of the AIRBM. The Stakeholder Forum will serve as a platform to support the engagement of communities in project consultations, including consultations on the Basin Development Objectives for the Ayeyarwady Basin Master Plan. It is envisaged that the Stakeholder Forum will be sustained by the GoM after the Project.

5. **Component Management Units (CMU):** CMUs will be established for each of the three Components reflecting the components' distinct technical focuses and relationships to different Departments within the MoT. Each CMU will be led by a Component Director. The Component Directors will report to the Project Director and be supported by Technical Specialists and Administrative Assistants. The Component Directors will be responsible for coordination and technical management of their respective Components, as well as providing technical support for the PMU's procurement efforts by managing the preparation of technical specifications, bidding documents and evaluation reports and advising on the acceptance of works, goods and services.

6. **Preparation of Future Investments (PFI):** The Component 1 CMU will implement the PFI and be responsible for screening and clearing proposals to the PFI in accordance with eligibility criteria that will be agreed between the World Bank and the GoM. All activities financed under the PFI will follow the same procedures for safeguards, procurement and financial management as all other activities under the Project.

7. **Hydro-Informatics Center (HIC):** An important entity within the project will be the HIC. The HIC will be led by the DG of DWIR/ Secretary of NWRC. The HIC will deliver basin-wide research, planning and analysis for the NWRC Secretariat. The NWRC in turn will provide recommendations on water resources management and development to the NWRC who are mandated by Presidential Decree to implement integrated water resources management in Myanmar. In the initial years, staff will be shared between the Secretariat and the HIC. In addition to the consultants supported under this project, it is expected that staff from various water related government agencies will be seconded to the HIC. In addition, the WBG was informed that the Dutch Government agreed to support the initial year's salary of 15 young professionals from the Yangon Technical University who will be assigned to the HIC. Consultants working on the Master Plan, Groundwater Survey, Sediment Survey and Strategic Environmental and Social Assessment under Component 1 are all expected to liaise with the staff of the HIC and provide opportunities for on-the-job learning.

8. **Expert Group.** The Expert Group is a key pillar of the NWRC design. The mandate of the NWRC Expert Group is to provide science-based advice to decision-makers, the private sector and grassroots peoples. The Expert Group includes 28 widely recognized Myanmar experts from a range of water-related disciplines.

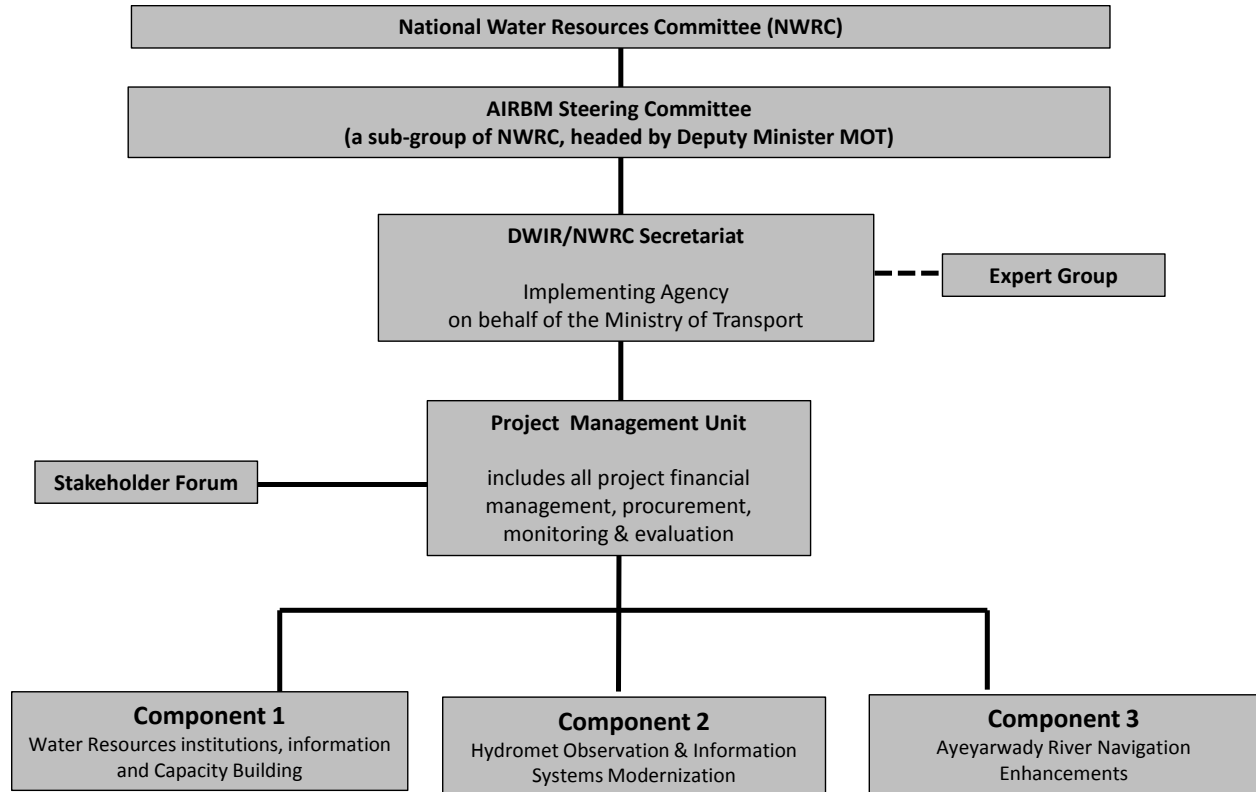
9. **Office locations and the construction of an NWRC Secretariat building:** The NWRC will set up offices in three locations: Mandalay, Yangon and Nay Phi Taw. Each office will serve a specific function: (i) the office in Yangon will manage the administration of the Project; (ii) the office in Nay Phi Taw will facilitate the executive functions of the NWRC; and (iii) the office in Mandalay, a purpose-built office, will become the permanent NWRC headquarters and HIC.

10. **Contingent Emergency Response:** The implementation arrangements for Component 4 will be detailed in the Contingent Emergency Response Implementation Plan.

11. **Data, Information and Knowledge Management and Sharing:** The nature of this project requires a great deal of data and information sharing among its cooperating agencies.

The Government will ensure that data will be shared in a timely manner and free of charge between the cooperating agencies in the preparation and implementation of the Project. In addition, to gain the greatest possible benefit from the knowledge investments made under this project, all consultancies that are tasked with developing data bases and models are required to transfer the technical knowledge and provide necessary training to the HIC to enable their use beyond the life of the Project.

Schematic of Project Implementation Arrangements



Lending Arrangements

12. There will be a Financing Agreement between IDA and the Republic of the Union of Myanmar represented by the MoF. The MoF will make the proceeds of the credit available to DWIR.

B. Financial Management, Disbursements and Procurement

Financial Management

13. **The overall financial management risk is assessed as “Substantial”.** An assessment of the FM arrangements was conducted on DWIR and DMH based on the guidelines issued by the FM Sector Board, as stipulated in OP/BP 10.0. The main risks that need to be addressed include: (a) inadequate documentation of policies and procedures (although the systems of internal control themselves are reasonably strong); (b) likelihood of delays and arithmetic errors due to the fact that all processes are manual rather than computerized; and (c) inexperience with managing and implementing Official Development Assistance projects. Recognizing capacity constraints in this regard, the project was designed to support activities within a single Ministry and to centralize all FM activities in a single office to leverage technical support and management oversight. These risks will be mitigated by: (a) having in place an acceptable PIM with an FM section for the project; (b) appointing full time qualified and experienced finance staff for the project, with support of a qualified financial management consultant (particularly in the initial project implementation phase to set up systems and build capacity of the DWIR/NWRC finance staff); (c) training in project financial management for all staff involved in the project; and (d) having satisfactory arrangements for the project financial statements to be externally audited on an annual basis.

Organization and Staffing

14. Financial management responsibilities will be centralized at the PMU to be located within the DWIR/NWRC Secretariat, under the management of the AIRBM Project Director. A financial management system for the project will be based on the Government system as operated by DWIR with appropriate revisions and mitigation measures as needed. In addition, a PIM has been drafted that includes procedures and controls for financial management for the project.

15. Selected staff of the Accounts section of DWIR will be assigned to the PMU full time to work on the financial management of the project. At least two staff, one senior and one junior will be required. The Director of Finance of DWIR will oversee the financial management of the project. Although DWIR/NWRC Finance staff appeared to have many years of experience in their field, they lack experience managing Official Development Assistance. Moreover, communication in English is also a challenge. Recognizing this, a qualified international financial management consultant and a local financial management consultant with a good command of English are needed at least at the initial stages of project implementation to support the project’s finance team until capacity is built. The consultants will be placed at the PMU, reporting to the Project Director and Director of Finance of DWIR. The international consultant’s term will be one year (on a need basis) to assist with setting up the financial management system for the project and train staff. The local consultant will assist in the day to day financial management work and hands on training to staff assigned to work on the project. Capacity building and transfer of knowledge shall be included in the TORs of the consultants. Moreover, staff assigned to the PMU will need training in accounting for projects as well as IT and English language skills.

16. Different project components will be implemented by different entities. Components 1 and 3 will be implemented under the DWIR/NWRC Secretariat, and Component 2 will be implemented by DMH. Finance staff at DMH will therefore also need to be assigned to take the

financial management responsibility of Component 2 and to coordinate with PMU within DWIR/NWRC Secretariat. At least two staff members, one senior and one junior, should be appointed at DMH.

Budgeting Process

17. The current budgeting process appears to be adequate for project budgeting purposes and therefore the project will follow the existing Government budgeting system and timetable to obtain Parliamentary approval. The Government budget is prepared on a cash basis and therefore Project budgeting and financial reporting will also be on a cash basis. A budget for the project will be prepared annually. Each implementing agency will prepare their own budget based on its annual work plan. All component budgets are to be endorsed by each Component Manager before submission to the PMU finance team for consolidation. Budgets will then be reviewed by the Project Director and approved by the Minister of Transport/PSC before submission to the Budget Department of the Ministry of Finance (MoF) and the Ministry of National Planning and Economic Development. The Budget Department of MoF and the Ministry of National Planning and Economic Development will then review and approve before submission by the MoF via the Vice President to the Parliament for approval. Where construction of an asset is involved, the Ministry of Construction and the Ministry of Industry's approval will also be required.

18. The annual budget will be broken down into six-monthly budget allocations based on the timing envisaged for implementation of project activities. Explanations of variances between actual versus budgeted expenditure will be reported in the Interim Unaudited Financial Report (IFR) and linked to any physical progress report of the project, if any, on a six-monthly basis.

19. It will be important that the budget for the initial period, from the Project effectiveness date, is included in the Government budget for the 2014/15 financial year. If project budget is not included in the Ministry's approved budget, then expenditures cannot be incurred and this could delay project implementation. The budget may be included in the revised budget. The supplementary budget process will take place during July/August and will be approved by Parliament in November. The approval process will be similar to that described above.

20. Budgets will be reviewed semi-annually and revised if necessary through the Government's supplementary budget process. The supplementary budget will be prepared and follow the same approval process as the annual budget. The budget execution will also be reviewed during each implementation support mission together with a review of implementation progress.

21. The budgeting process, timing and review of execution will be detailed clearly in the Project Implementation Manual's financial management section.

Accounting Policies and Procedures

22. The Project will use cash basis accounting for preparation of the Project's interim financial statements and annual financial statements. Departmental accounts are also prepared on a cash basis.

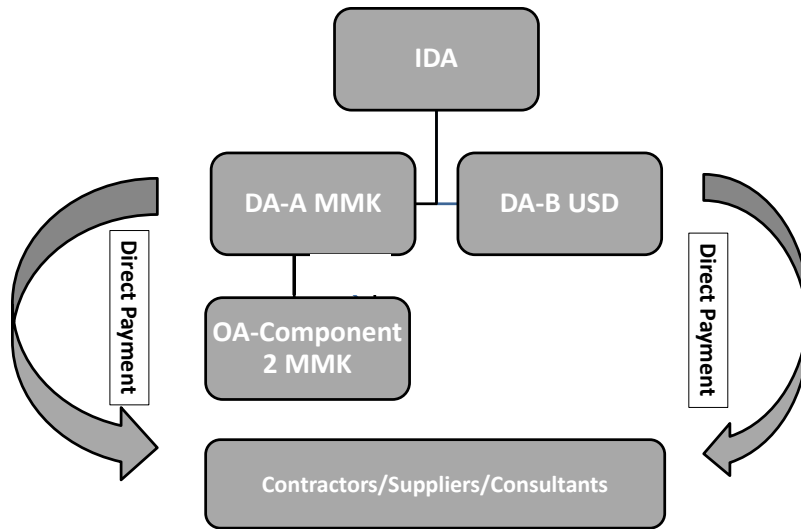
23. As indicated above, a financial management section has been prepared as part of the draft PIM. Appropriate accounting policies and procedures have been agreed and financial reporting procedures included in the PIM. A financial management consultant was provided to support the PMU in preparing the draft PIM. The consultant will continue to review the current policies and procedures and the detailed systems of internal control and determine if any additional control measures need to be implemented for the Project. The PIM shall be subject to review and acceptance by the World Bank. The financial management section shall also be made available in Myanmar language.

Internal Controls

24. The Project will use the existing systems of internal control plus any enhancement that will be identified by the consultant. These will then be properly documented in the financial management section of the PIM. Specific controls over soft expenditures (training, workshops and travel and accommodation), advance and commitments monitoring will be implemented. The policies and procedures for accounting, financial authorities and delegation levels, segregation of duties for incompatible functions, reconciliations and policies on safeguarding of assets will be detailed in the financial management manual/section of the PIM.

Fund Flows

25. PMU will open two Designated Accounts (DAs) at the Myanma Economic Bank (MEB). DA-A is to be denominated in Myanmar Kyat (MKK) and DA-B in US Dollars (US\$). The DAs will be managed by the PMU. In addition, an operating account (OA) denominated in MMK at MEB to receive funds (advances) by DMH for implementation of Component 2 of the project. This is necessary because the implementer of Component 2 (DMH) is based in Nay Pyi Taw while the PMU will be located in Yangon. Advances to the OA shall be based on a 3 month budget/forecast. The implementers of all components can also request the PMU to make payments directly from either of the DAs to contractors/suppliers/consultants.



Financial Reporting

26. Each implementing agency will be responsible for recording all financial transactions relating to their components. The DWIR finance team as part of the PMU will be responsible for consolidating reports and submitting one project financial report to the Bank. As the implementer of Component 2 (DMH) is in a different location, they will prepare financial statements in an agreed format and submit them to the PMU for record and for consolidation purposes. The PMU finance team will be responsible for preparing the semi-annual IFRs and the annual project financial statements. The existing manual system will be used to record the Project’s financial transactions on a cash basis. However, assessment and determination will be made during the first six months of project implementation if accounting software will be required to aid recording and timely preparation of financial statements. Controls and procedures shall be elaborated in the financial management section of the PIM. The semi-annual IFR will also report on implementation progress and variance analysis. The report shall be prepared collaboratively by implementers of all components. The Project Director will review and approve the IFR prior to it being submitted to the World Bank. The IFR will be forwarded no later than sixty (60) days after the end of each semester of the Fiscal Year 2015-16, and forty five (45) days after the end of each semester in the subsequent fiscal years. The format and content of the IFR is included in the PIM.

Audit Arrangements

27. The Union Office of the Auditor General will be the external auditor of the Project based on TORs acceptable to the World Bank. DWIR will discuss with the Auditors General to agree the TORs within 6 months of project effectiveness. Copies of audit reports and management letters will be submitted to the World Bank no later than six months after the end of each fiscal year (31 March). The audit report and audited financial statements are required to be publicly disclosed following the World Bank Policy on Access to Information. It has been agreed that the audit report and audited financial statements will be disclosed on DWIR website.

Implementation Support and Supervision Plan

28. Implementation support for financial management functions will be made available frequently in the first year of project implementation, and then at least bi-annually thereafter, depending on the updated project financial management risk assessment and progress with implementation of the FM capacity building program. The FM missions will include reviews of the ongoing adequacy of the financial management arrangements, progress with FM capacity building and progress with the proposed financial viability action plan for the power sector.

Disbursements Arrangements

29. The primary disbursement methods will be Advances and Direct Payments. Reimbursements and Special Commitments will also be made available. Two DAs will be opened at the MEB. Summary Sheets with Records and Statement of Expenditures (SOE) will be required for documenting eligible expenditures and reimbursements to be paid by the DAs. Direct Payments will be documented by Records. The frequency of reporting of expenditures paid from the DAs shall be monthly or a period not to exceed a quarter. DA-A and DA-B will have Variable Ceilings based on 6 monthly forecasts. Given that the PMU is located in Yangon and implementer of Component 2 is located in Nay Pyi Taw, an operating account (OA) denominated in MMK will be opened by DMH to allow for a more efficient implementation of Component 2 activities. The transfer to this operating account will be considered as an advance and should cover three months' worth of planned expenditures of Component 2, with monthly reporting on the use of funds. This account will appear as a reconciling item on the DA Reconciliation Statement to the extent that it has not been accounted for.

30. The minimum application size for Reimbursements, Special Commitments and Direct Payments will be US\$50,000 equivalent.

31. The project will have a Disbursement Deadline Date (final date on which the World Bank will accept applications for withdrawal from the Recipient or documentation on the use of Credit proceeds already advanced by the World Bank) of four months after the Closing Date of the project. This "Grace Period" is granted in order to permit orderly project completion and closure of the Credit account via the submission of applications and supporting documentation for expenditures incurred on or before the Closing Date. Expenditures incurred between the Closing Date and the Disbursement Deadline Date are not eligible for disbursement, except as otherwise agreed with the World Bank. All documentation for expenditures submitted for disbursements will be retained at the PMU during the lifetime of the project and be made available to the external auditors for their annual audit, and to the World Bank and its representatives if requested. After project closing, the relevant documentation will be retained for two years, following the Government's regulations on record keeping and archiving⁵. In the event that

⁵ The General Conditions require the Recipient to retain all records (contracts, orders, invoices, bills, receipts, and other documents) evidencing eligible expenditures and to enable the Bank's representative to examine such records. They also require the records to be retained for at least one year following receipt by the Bank of the final audited financial statement required in accordance with the legal agreement or two years after the closing date, whichever is later. Recipients are responsible for ensuring that document retention beyond the period required by the legal agreement complies with their government's regulations.

auditors or the World Bank implementation support missions find that disbursements made were not justified by the supporting documentation, or are ineligible, the World Bank may, at its discretion, require the Recipient to: (i) refund an equivalent amount to the World Bank, or (ii) exceptionally, provide substitute documentation evidencing other eligible expenditures.

32. Before the World Bank closes the Credit account (two months after the Disbursement Deadline Date), the Recipient must provide supporting documentation satisfactory to the World Bank that shows the expenditures paid out of the DAs, or refund any undocumented balance. If the Recipient fails to provide the documentation or refund required by the World Bank by this date (two months after the Disbursement Deadline Date), the World Bank does not permit the use of the DAs under new Grants/Credits made to or guaranteed by the Recipient.

33. Disbursements from the Credit shall be made against the following expenditure categories:

Expenditure category	IDA US\$ Equivalent	IDA Percentage of Financing (inclusive of taxes)
Goods, works, non-consulting services, consultants' services, training and operating costs under Parts 1, 2 and 3 of the Project	100,000,000	100%
Emergency Expenditures under Component 4	0	100%
Total	100,000,000	

34. Operating Costs means the reasonable costs of goods and non-consulting services required for the day-to-day coordination, administration and supervision of Project activities, including leasing and/or routine repair and maintenance of vehicles, equipment, facilities and office premises, fuel, office supplies, utilities, consumables, communication expenses (including postage, telephone and internet costs), translation, printing and photocopying expenses, bank charges, publications and advertising expenses, insurance, Project-related meeting expenses, Project-related travel, subsistence and lodging expenses, and other administrative costs directly related to the Project, but excluding salaries, bonuses, fees and honoraria or equivalent payments of members of the Recipient's civil service.

Disbursement for Component 4: Contingent Emergency Response

35. No withdrawal shall be made under Component 4 until the government has: (a) declared that a crisis or emergency has occurred, and the WB has agreed with such determination; (b) prepared and adopted the Contingent Emergency Response Implementation Plan; (c) prepared and disclosed all safeguards instruments required for activities under Component 4 of the Project, if any, and the government has implemented any actions which are required to be taken under said instruments; and (d) established adequate implementation arrangements, satisfactory to the WB, including staff and resources for the purposes of said activities. The Implementation Plan will be developed during the first year of project implementation or in any event prior to the release of any funds under Component 4.

36. Disbursements for Component 4 would be made either against a positive list of critical goods and/or against the procurement of works, and consultant services required to support the

immediate response and recovery needs of GOM. All expenditures under this component, should it be triggered, will be in accordance with OP/BP 10.00 and will be appraised, reviewed and found to be acceptable to the Bank before any disbursement is made. All supporting documents for reimbursement of such expenditures will be verified by the internal auditors of GOM, where applicable, and by the implementing agency, certifying that the expenditures were incurred for the intended purpose and to enable a fast recovery following the crisis or emergency, before the withdrawal application is submitted to the Bank. This verification would be sent to the Bank together with the application.

Retroactive Financing

37. Retroactive financing of about \$10 million will be applied in this project for eligible expenditures as of October 1, 2014. Activities which may require retroactive financing, particularly in the event of an unanticipated delay in credit signing, include expenses for critical project startup activities, such as: i) office and laboratory equipment; ii) vehicles; iii) individual consultants to help support the project and component management units; iv) urgent design contracts with firms; and vii) incremental operating costs.

Financial Management and Disbursement Action Plan

Action	Responsible party	Timing
Recruitment of international and local qualified financial management consultants with TORs acceptable to the World Bank	PMU	Within 3 months of project effectiveness
Agreement on audit TOR with the OAG on project annual audits.	PMU	Within 6 month of project effectiveness

Note: These requirements will be specified in the Project Implementation Manual, which the Borrower is legally obligated to follow, and will be controlled by the task team through the project supervision process.

Procurement

38. In Myanmar, there is no comprehensive written legal framework for public procurement. The existing rules include: (i) two Instructions from the Office of President in 2011, one for a change from "closed tender" to "open tender" and another for decentralizing procurement to line Ministries; (ii) a Tender Directive which was issued by the President's Office in April 2013 to address issues in processing open tenders; and (iii) a Tender Directive for procurement of civil works that was prepared by the Ministry of Construction and issued by the Office of President in January 2014.

39. An assessment of the public procurement system in the MoT and procurement practices within DWIR began in February 2014 and concluded in June 2014.

40. The assessment identified the following major risks which could arise during project implementation concerning procurement and suggested measures for mitigation of these risks:

- Lack of a legal framework of public procurement: There is no comprehensive written legal framework for public procurement and no procedures in writing within MoT. This may cause confusion regarding the appropriate the procedures and rules to be followed under the project. To address this risk, it is clarified and agreed with DWIR/DMH that the project shall strictly follow the World Bank procurement/consultant Guidelines.
- Price Negotiations: When competitive bidding procedures are followed, the practice of price negotiations shall not be used for contracts financed by this project.
- Limited capacity and experience with procurement: Procurement experience within DWIR and DMH is very limited. This will be the first time these Departments conduct procurement in accordance with the World Bank's procedures. For implementation of the proposed project, an international procurement consultant shall be employed to assist DWIR and to provide knowledge transfer and capacity building to the assigned procurement staff. DWIR should assign at least one full-time officer to work with the procurement consultant. The Bank team will provide procurement training to the implementing agency staff to familiarize them with the Bank's procurement policies and procedures.
- Inadequate Technical Specifications and the use of brand names: The procurement consultant will assist in preparing technical specifications following international practice.
- Possible lengthy process of procurement: When the procurement plan is prepared, major milestones for each contract will be identified and strictly supervised. The Bank team will closely monitor progress.
- Using own resources for civil works (Force Account): Currently the majority of investment on civil works construction in DWIR is being implemented by DWIR within its own resources (constructional equipment, manpower, etc.) which is similar to "Force Account". Only a few construction firms are available from the national market. It is expected that the Phase I of Construction of River Navigation Enhancement Works will be implemented through Force Account due to its urgency and the size of the investment (above the capacity of the national firms and not attractive to international contractors). To mitigate related risks: (i) The detailed designs of this Phase I works will be provided by the Netherlands TA which should be subject to review by the World Bank (ii) the construction will be verified by an independent international consultant to be hired under the project to assess construction norms, unit costs; and (iii) detailed procedures for implementing force account will be specified in the project manual and subject to the World Bank no objection.
- Procurement through national competitive bidding (NCB): Subject to availability of qualified and eligible bidders from the national market, some contracts may be procured through NCB. This will be the first time for MoT to conduct NCB which is acceptable to the World Bank Procurement Guidelines. During the appraisal, major conditions of NCB were agreed with MoT and the World Bank team will assist MoT to prepare NCB

bidding documents which should be acceptable to the World Bank. Additionally, the procurement consultant will provide guidance to MoT for conducting NCB procurement.

41. With the above mitigations, the residual procurement risk under the project is still rated as “High”.

42. **Applicable Guidelines.** Procurement for the project will be carried out in accordance with the World Bank’s “Guidelines: Procurement of Goods, Works, and Non-Consulting Services under IBRD Loans and IDA Credits and Grants by World Bank Borrowers” dated January 2011 (revised July 2014), “Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits and Grants by World Bank Borrowers” dated January 2011 (revised July 2014), and the provisions stipulated in the Financing Agreement.

43. **Procurement Plan.** During project appraisal, the implementing agencies prepared and discussed a procurement plan for project implementation. A summary of the procurement plan is presented below. DWIR shall update the procurement plan throughout the duration of the project, at least annually or as required, to reflect actual project implementation needs and improvements in institutional capacity. The World Bank will arrange publication on its external website of the agreed initial procurement plan and all subsequent updates once it has provided a no objection.

Summary of Procurement Plan

Procurement Method	Contract Value Threshold (US\$)	Prior Review Threshold (\$'000)
ICB (Goods)	Above 200,000	All contracts
NCB (Goods)	Above 50,000	First contract
Shopping (Goods)	Below 50,000	First contract
ICB (Works)	Above 300,000	All contracts
NCB (Works)	Above 100,000	First contract
Shopping (Works)	Below 100,000	First contract
Force Account	-	-
Direct Contracting	-	All contracts

44. **Reference to Project Implementation Manual (PIM):** Procurement will be conducted in line with the provisions of the PIM which will provide detailed procedures including those for using Force Account (using Ministry’s own resources for civil works). The PIM must be acceptable to the Bank. In the event that funds are reallocated to Component 4 to finance goods, works and consultant services required for an immediate response to an eligible crisis or emergency, procurement will be arranged following the Bank’s guidelines and will be further detailed in the Contingent Emergency Response Implementation Plan.

Summary of the Procurement Packages after Project Effectiveness

1	2	3	4	5	6	7
Ref. No.	Description	Estimated Cost US\$	Packages	Domestic Preference (yes/no)	Review by Bank (Prior / Post)	Comments
1	Summary of the ICB (Goods) packages	24,385,000	12	No	Prior	
2	Summary of the NCB (Goods) packages	358,000	3	No	Post	First contract for prior review
3	Summary of the other (Goods) packages	50,000	1	No	Post	First contract for prior review
4	Summary of the ICB (Civil Works) packages	30,150,000	5	No	Prior	
5	Summary of Civil Works Force Account packages	3,000,000	Multiple	No	Post	
6	Summary of Non-Consultant Services packages	2,000,000	2	No	Prior	

Selection of Consultants

45. **Prior Review Threshold:** Selection decisions subject to Prior Review by the Bank as stated in Appendix 1 to the Guidelines Selection and Employment of Consultants:

Selection Method	Contract Value Threshold (US\$)	Prior Review Threshold (US\$)
QCBS/QBS (Firms)	Above 100,000	Above 100,000
CQS	Below 100,000	Below 100,000
Single Source (Firms)	-	All contracts
Individual Consultants (IC)	-	First contract; all legal and fiduciary positions; and long term advisory positions
Single Source (IC)	-	Above 10,000

Consultancy Assignments with Selection Methods and Time Schedule

1	2	3	4	5
Ref. No.	Description of Assignment	Estimated Cost US\$	Packages	Review by Bank (Prior / Post)
1.	Summary of number of contracts that will be let under QCBS	18,600,000	11	Prior
2.	Summary of number of contracts that will be let under QBS	300,000	1	Prior
3.	Summary of number of contracts that will be let under Individual Consultant	4,144,000	22	Post

46. **Frequency of Procurement Implementation Support.** The procurement capacity assessment indicated the need for bi-annual support missions to assist in project implementation especially during the first year of operation. The frequency of implementation support for procurement will be further defined depending on the progress and capacity of the implementing agencies.

C. Environmental and Social (including safeguards)

47. The project is expected to have positive social benefits for men, women, minors and vulnerable groups by: (a) enhancing water resources management thereby contributing to the delivery of more reliable and better quality water to all users; (b) strengthening disaster risk management efforts related to flood, drought and storm risks by improving predictions of the timing and severity of weather extremes and delivering more effective warnings; (c) reducing the vulnerability to poor communities living in flood prone areas by better forecasting and emergency response to hydrological events; and (d) enabling safer, more efficient inland water transport.

48. The overall project has been classified as environmental category “A” in accordance to the World Bank policy OP/BP 4.01 on *Environmental Assessment* due to its spatial extent, the richness and diversity of its ecology and extent of its resources and support to livelihoods and its focus on integrated river basin planning (Component 1) through the development of a Ayeyarwady River Basin Management Plan and because of the river-related infrastructure works under Components 2 and 3, as well as the technical studies to be undertaken in Component 1 which could potentially lead to investments that have significant impacts on the river system as well as site-specific safeguard impacts. For instance, proposed interventions under Component 3, such as dredging and civil works, may generate site-specific environmental impacts and changes in river flow and sediment flux. The significance of these impacts will be determined in the Environmental Assessment although they may be effectively prevented or significantly reduced through good detailed design and the application of appropriate actions to be specified in the ESMPs and incorporated in bidding documents for the works contracts. Specific infrastructure investments, however, once identified in terms of location, characterized for their technical complexity and assessed in view of their impact may qualify for category “B” and/or category “A” impact subprojects. The World Bank safeguards policies triggered include *Environmental Assessment* (OP 4.01), *Natural Habitats* (OP 4.04), *Physical Cultural Resources* (OP 4.11), *Forests* (OP 4.36), *Pest Management* (OP 4.09), *Safety of Dams* (OP 4.37), *Involuntary Resettlement* (OP 4.12) and *Indigenous Peoples* (OP 4.10).

49. Projects on International Waterways (OP/BP 7.50) is also triggered. The Ayeyarwady rises in the Himalayas, bisects Myanmar from north to south and empties through a nine-armed delta into the Bay of Bengal. A portion of the catchment areas that feed two of the tributaries of the river (the Maykha⁶ and the Malikha⁷) are located in China. The Malikha tributary in turn is fed by a sub-tributary originating within India. This meets the definition of an International Waterway as stipulated in paragraph 1 of the World Bank’s Operational Policy 7.50 on

⁶ Referred to as the Daying in China.

⁷ Referred to as the Jiang in China.

International Waterways, although the combined flow outside of Myanmar is estimated to be less than 1 percent. The planned investment activities involve minor additions or alterations to an ongoing scheme of river training and protection, feasibility studies for potential future investments in the river basin and water resource/groundwater surveys. Although modeling and the environmental assessment have yet to be done, it is not anticipated that the construction or rehabilitation works proposed under the project will adversely change the quality or quantity of water flowing in the river and the project will not be appreciably affected by other riparians' possible water use. On this basis, the Bank has determined that the proposed project does not require riparian notification in accordance paragraphs 7(a) and 7(b) of OP 7.50.

50. **Environmental and Social Management Framework (ESMF):** In accordance with the requirement of a Category 'A' project, an ESMF has been developed by the DWIR, in consultation with main stakeholders, to ensure the environmental and social assessment, and other safeguard requirements be carried out in compliance with the social and environmental policies and procedures as specified by Myanmar and the World Bank Group safeguard policies. The ESMF will be applied to all infrastructure projects that are identified during project implementation and those financed by the Preparation of Future Investments (PFI) sub-component. The activities to be supported by the PFI sub-component will be required to have ESIA's and specific safeguard instruments, where needed, based upon the ESMF.

51. The ESMF provides for the management of social and environmental risks and impact mitigations for works whose specific location is unknown prior to appraisal. Specifically, the ESMF include:s (a) screening and scoping criteria for individual sub-projects that are identified during project implementation or to be included in the PFIs activities; (b) process for project Categorization (A or B) and the definition of the required safeguard work; (c) roles and responsibilities for safeguards implementation from the Borrower and Bank's side; (d) types of safeguard instruments (ESIA; ESMP) to be prepared and implemented for all subprojects and activities; (e) Resettlement Policy Framework (RPF) for land acquisition and resettlement; (f) Indigenous Peoples Planning Framework (IPPF) concerning ethnic minorities; (g) Terms of Reference for ESIA and ESMP for Category 'A' projects; (h) management of environmental impacts for small construction projects; and (i) preliminary draft Terms of References for a Strategic Environmental and Social Assessment (SESA).

52. Based on current design, it is expected that an **Environmental and Social Management Plan (ESMP)** will be prepared for the civil works related to: (a) infrastructure navigation works on selected river sections, for which feasibility studies and designs need to be prepared or revised; (b) construction or rehabilitation of buildings/offices for the DWIR, DWIR Secretariat and HIC office in Mandalay, Yangon and Nay Pyi Taw; (c) installation of river water monitoring stations and other relevant weather and hydrologic observing network stations; and (d) installation of navigation aids along the selected river sections. However, this needs to be assessed in detail once the exact location and scope of specific activities have been identified during project implementation. Whereas the ToRs for the technical assistance activities under the project (e.g., water quality monitoring, sediment and groundwater surveys, the fleet optimization study, basin-wide diagnostics, legal and institutional reviews) will include provisions that these studies and their outputs be developed taking in consideration the Bank's

safeguards policies, including the required disclosure and consultation processes.

53. **Strategic Environmental and Social Assessment (SESA).** To support the development of a long-term basin-wide perspective, a SESA will be prepared during project implementation (under Component 1) in parallel with the basin Master Plan. This SESA will aim to support integrated river basin planning and management by identifying and assessing key environmental and social issues and developing mitigation measures to be embedded into the Master Plan in line with the environmental and social legislation of Myanmar and the World Bank's environmental and social safeguards policies. The SESA will also provide the opportunity to assess baseline information on the environmental and social conditions of the basin, and assess regional and cumulative impacts of current and planned investments in the Basin. The SESA will be carried out as a process, and will create a platform for stakeholder engagement. The SESA will be managed to optimize the transfer of knowledge, previous experiences in river basin planning and international best practices to stakeholders and officials in Myanmar in order to contribute to the development of national capacity for environmental and social risk and impact management.

54. The PFI (sub-component 1.3) will support the preparation of feasibility studies, ESIA's, RAPs, IPPs and other preparatory studies for investments that may be implemented in future phases of this program or financed by others. These potential future investments (i.e., in irrigation, hydropower, navigation, delta management, municipal water supply or wastewater management systems) are likely to have adverse and irreversible (including cumulative) environmental and social impacts. The Terms of References (TORs) for these studies will include screening of environmental and social safeguard risks, impacts and issues in line with relevant World Bank safeguards policies.

55. **Resettlement Policy Framework (RPF).** The ESMF includes a RPF to address any land acquisition and other involuntary resettlement impacts. Specifically, the RPF provides: (a) description of potential land acquisition or involuntary resettlement impacts; (b) measures to prepare Resettlement Action Plans to mitigate and compensate for impacts through meaningful participation of affected people in developing the mitigation and compensation measures; (c) institutional arrangements and implementation procedures, with a clear description of roles and responsibilities of key stakeholders; (d) monitoring and grievance mechanisms; and (e) budget.

56. Should land and other property loss occur, OP/BP 4.12 requires that resettlement compensation at replacement value outlined in the ESMF be used by the Government to make the necessary compensation. This amount will be provided from the Government budget. For investments identified under the Component 1.2 (and 1.3) to be financed under follow-up phases, the SESA will assess the potential issues and mitigation measures. If any of these investments will involve the development of feasibility studies and/or designs, involuntary resettlement impacts will be assessed and, if needed, Resettlement Action Plans prepared.

57. **Indigenous Peoples Planning Framework (IPPF).** An IPPF has been developed as part of the ESMF to provide for culturally appropriate benefits, mitigation measures and mechanisms to ensure the meaningful participation of ethnic minorities in the Project. The IPPF has been put in place since the exact location of the works is unknown. Component 3 dredging work may

result in economic disruptions. In addition, Component 2 hydromet modernization activities and Component 1 studies, which will be undertaken to support the Ayeyarwady River Basin Master Plan as well as financed through the IPF, may be implemented in areas where ethnic minorities are present. The IPPF will ensure that project financed activities affecting ethnic minorities provide culturally appropriate benefits to ethnic minorities and do not have adverse impacts on ethnic minorities or that such impacts, if unavoidable, are minimized and mitigated. It also aims to ensure that project activities affecting ethnic minorities, whether positively or adversely, are prepared in a participatory manner based on a social assessment and free, prior and informed consultations leading to their broad community support.

58. A preliminary ethnic minority screening has been conducted by the Bank and did not identify any ethnic minorities in the area of influence of the navigation investments. However, triggering of OP/BP 4.10 allows for a thorough ethnic screening during the detailed design of the various investments. The river traverses Kachin *ethnic state*, and the SESA and Master Plan as well as any proposed projects in Kachin under the preparation of future investments sub-component will assess potential issues, risks and opportunities concerning ethnic minorities in Kachin as well as in other areas of the river basin.

59. During implementation, if necessary, **Indigenous Peoples Plans (IPP)** will be developed based on a social assessment and free, prior and informed consultation processes with affected ethnic minorities when the exact scope and scale of site-specific project activities become known. The IPPs will include among other things: (a) demographic, ethnic and socioeconomic characteristics of affected ethnic minorities; (b) description of the likely project impacts; (c) summary of findings of the social assessment and consultation process; (d) measures to avoid or mitigate adverse impacts and measures to ensure culturally appropriate benefits to ethnic minorities; (e) institutional arrangements with detailed description of the roles and responsibilities of stakeholders including the government agencies in charge of IPP implementation; (f) description of mechanisms for public disclosure, monitoring and evaluation, and to address grievances; and (g) estimated budget. For investments identified under the Component 1.2 (and 1.3) to be financed under follow-up phases, a SESA will also be carried out to assess the potential issues and opportunities for ethnic minorities and IPP will be developed as needed during the feasibility studies.

Summary of ESMF Public Consultations

60. Two rounds of public consultations associated with the ESMF have been conducted in according to the WBG safeguards policies. The first round of public consultations was carried out by the DWIR May 16 and 19, 2014 in Mandalay and Yangon, respectively. Participants included CSOs, local NGOs, International NGOs, and the River Users' Association, researchers, private sector and the media. The main objectives of the consultations were to: (a) provide background information on the proposed AIRBM Project; (b) obtain feedback on the scope of work of the draft Environmental and Social Management Framework (ESMF) Terms of Reference (TOR); (c) discuss ways to maximize benefits from the proposed Project; and (d) discuss ways to improve the Project consultation processes. The documents used for consultation included the Myanmar and English versions of Project Information Document (PID), Integrated

Safeguard Data Sheet (ISDS), and the draft Environmental and Social Management Framework (ESMF) terms of reference.

61. Invitations were issued and documents were circulated and posted on the Directorate of Water Resources and Improvement of River Systems (DWIR) website www.DWIR.coffeecup.com, in both English and Myanmar language two weeks before the meetings. All the meetings were led by the AIRBM Project Director, U Sein Tun. The sessions were conducted in both English and Myanmar language with some simultaneous translation provided. Overall, the consultations were well relatively attended, informative and constructive. The participants highlighted important issues for attention, provided the Bank and government teams with valuable information, and confirmed the need and value of improving the country's capacity to better plan and manage the Ayeyarwady River.

62. The second round of public meetings took place on September 18 and 19, 2014 in the same locations. The draft ESMF was disclosed in country in local language and in English on September 4, 2014, and in English in the Infoshop on August 13, 2014. The ESMF provides detailed description of the issues raised and responses from the Project Director and the Secretary of the NWRC Expert Group. Participants were generally supportive of the proposed project and the ESMF. They emphasized the importance of the Ayeyarwady river basin for local communities and national development. In addition to questions raised to seek more information about the proposed project, loan conditions and its various activities, the key issues raised during the consultation process include:

- a) Participants highlighted the importance of maintaining and improving water quality and the health of the Basin's biodiversity, forests and watershed, and noted concerns with mining and other activities affecting downstream communities and leading to bank erosions;
- b) The need to increase knowledge related to groundwater resources in order to sustainably utilize and manage those resources was underscored;
- c) Participants stressed the need for a robust consultation and participation approach that would be open to all interested parties, including representative of local communities and users of the river basin. They encouraged early establishment of the Stakeholder Forum and requested that the Ministry of Transport coordinate closely with other relevant line ministries;
- d) Similarly, they stressed the need for a thorough and user-friendly dissemination and disclosure approach for project related information, including data collected during project implementation, the ESMF and safeguard plans prepared during project implementation;
- e) Questions were raised regarding the overlap between national legislation and the World Bank policies concerning ESIA and related safeguard issues and how gaps would be overcome;
- f) Some raised concerns about potential future hydropower developments that would affect downstream communities.

63. **Disclosure of safeguards document:** The ESMF, including the RPF and the IPPF, both in English and in the Myanmar language, were disclosed on the MOT's website on September 4, 2014 and published in the InfoShop on August 13, 2014. The ESMF Executive Summary was submitted to Board on August 15, 2015. The final English version of the ESMF was disclosed on October 24, 2014 in the Bank's Infoshop, and both the final English and Myanmar language were disclosed in the DWIR website on October 27, 2014. Intermediate drafts were also

disclosed prior to the disclosure of the final ESMF. Any subproject that requires a safeguard instrument such as an ESIA, RAP, or IPP, will follow Bank operational policy rules for consultation and public consultation. For any identified Category A subproject, the Executive Summary will be submitted to the World Bank Board for information and consultation if required, at least 120 days prior to the start of subproject works contracting.

Safeguards Implementation and Capacity Building Arrangements

64. The safeguard capacity of the institutions involved in project implementation and river basin management will be enhanced through training and learning-by-doing activities. A safeguards institutional capacity and capacity building plan has been developed and agreed upon with counterparts in order to provide the support required to implement the different safeguards activities related to this project.

65. The PMU and related ministries will be responsible for safeguard compliance under the project. The day-to-day implementation will be delegated to each CMU and each CMU will include designated safeguards staff focal point.

66. Capacity building and training will ensure that the specialists are able to manage and monitor the environmental and social aspects of the AIRBM activities. The safeguard capacity of the institutions involved in project implementation and river basin management will be enhanced through training and learning-by-doing activities. A detailed safeguards institutional capacity and capacity building plan will be developed and agreed upon with counterparts at the beginning of project implementation in order to provide the support required to implement the different safeguards activities related to this project.

Monitoring

67. Social and environmental monitoring will be carried out by the PMU. During investment supervision activities, the CMUs will check with local environmental authorities to determine if project implementation is meeting all specified ESMFs, ESIA and ESMP requirements and is in line with the national legislation. CMU environment and social experts will also perform site visits during the various stages of investments construction to verify whether the ESMPs are being adequately implemented. A report covering the environmental management issues and compliance with the ESMP should be included in the overall site visit report. The designated environmental and social specialists will prepare quarterly and annual reports on the key steps, outputs and results of the environmental management actions taken for all investments throughout the project cycle.

68. As part of the reporting, the PMU will request each CMU to include a section on environmental performance with respect to their respective investments, including any critical mitigation actions taken and any significant environmental or social incidents. The PMU will include an environmental and social safeguards section in every report prepared for the World Bank. As appropriate, the section will discuss details of any environmental and social issues that have occurred during the reporting period and the actions taken to resolve them. Problems and issues arising during the use of the ESMF, ESIA or ESMP will be flagged and brought to the

attention of Managers and for their action. Copies of the quarterly and annual environmental and social monitoring reports will also be sent to the World Bank. The Bank will also review these reports during the periodic supervision missions.

69. **Gender:** Vulnerability to weather-related hazards is a particular concern in Myanmar and one that disproportionately affects women and children. Globally, Save the Children has found that women and children are up to 14 times more likely to die in natural disasters than men. The Post-Nargis Joint Assessment of 2008 found that 61 percent of those who died during the cyclone were female and in some severely affected areas twice as many women aged 18-60 died as men.

70. Since the Nargis disaster in 2008, significant efforts with regard to disaster risk reduction have been implemented in the river delta areas especially by members of the Disaster Risk Reduction Working Group, including setting up Village Disaster Management Committee (VDMC) and providing training on gender-sensitive community based disaster risk reduction. As part of the village DRM planning process, communities will develop hazard, resource, capacity and vulnerability mapping including women and vulnerable groups such as children, the elderly and disabled, in order to assess risks and develop DRM plans. Although public awareness on gender and disaster risk management has increased, the involvement of women and disabled in VDMC varies depending on the operational modality of each agency working in the area.

71. The Post-Nargis Disaster Response pointed out weaknesses in the communication infrastructure of national forecasting and early warning systems beyond the township level. Currently, the linkage between VDMCs to the formal village tract and township administration is still limited and needs to be enhanced. Many NGOs, INGOs, UN agencies and village volunteers operating in the areas could provide significant support to the Township Disaster Management Committee in this regard.

72. Besides limited communication technology at the community level, women in Myanmar especially in rural areas often face difficulties in participating in the village decision making forum where critical information is shared and discussed. Gender norms and practices have limited the opportunities for women to participate in decision making and to get access to essential information, including climate-related information, farm technology and advisory services.

73. In the agricultural sector, women constitute more than half of the sector's population at 51.2 percent of the 25.72 million people. There are 5.4 million individual agricultural holdings, 15 percent of them, or 816,000 holdings, are headed by women; more than 50 percent of these women are 60 years or older, and 80 percent of these women are widows. Women farmers often do not participate in the extension services and training as the village administrators tend to invite heads of the households to attend the training. Information and technology provided by the government have not yet covered issues related to climate change, adaptation, and food security.

74. Gender awareness and the capacity of government agencies on gender-sensitive information for climate smart agriculture and disaster preparedness are still limited. Line ministries do not have gender focal point persons, and staff have not received gender awareness

training. The gender knowledge especially on gender and climate change in agriculture are new to the country and the information and training contents would need to be simplified for all users.

75. In order to promote equity and leverage the positive impacts of enhanced disaster warnings and agricultural advisories, gender considerations will need to be integrated in the project design and activities. Efforts would need to be made to reach out to women and women's groups in the design and implementation of activities related to disaster warnings and agricultural advisories, and capacity building opportunities. The project will include: (a) integrate gender dimensions in the key assessment and planning including the Ayeyarwady Integrated River Basin Master Plan and the SESA; (b) integrate gender aspects in the implementation of the Stakeholder Forum and all communications and outreach activities including the dissemination of disaster warnings and agricultural advisories; (c) ensure that male and female staff of relevant agencies and communities have equal opportunity to participate in the capacity building and training support from the Project; and (d) to the extent possible, collect gender disaggregated data which is essential to monitor progress in addressing gender gaps.

Grievance Redress Mechanisms

76. To ensure that affected communities have avenues for raising complaints relating to the project activity/subproject and safeguards procedures, a multi-step grievance procedure will be put in place, building on local systems of conflict resolution and complaint procedures in the respective communities. The ESMF includes a grievance redress mechanism, which will be further elaborated during project implementation. The SESA will also assess in more detail appropriate grievance redress mechanisms for the project. In addition, the Stakeholder Forum (Component 1) will also provide an avenue for public consultation, community and grievances. Site-specific safeguard instruments (ESIAs, ESMPs, RAPs and IPPs) will include a detailed sub-project specific grievance redress mechanism as described in the ESMF.

D. Monitoring and Evaluation

77. **Monitoring and Evaluation.** The PMU will monitor progress against the agreed performance indicators in Annex 1 and produce quarterly progress reports. Data will be collected for each of the indicators with support from the DWIR, DMH and CMUs who will be responsible for monitoring technical progress. The PMU will produce the data for the results framework indicators on an annual basis as well as for the mid-term review and at project completion, and will discuss progress and performance related to the changes in these indicators from one year to another. During implementation, the PMU will recruit dedicated staff to monitor project progress and update the intermediary indicators. The PMU's monitoring and evaluation (M&E) system will include all three project components.

78. The PMU will carry out a mid-term review to assess the status of the Project as measured against the performance indicators. Such a review would include an assessment of: (a) overall implementation progress of the Project; (b) results of M&E activities; (c) progress on procurement, disbursement and financial management; (d) progress on the implementation of the ESMF and other safeguards measures; (e) implementation arrangements; and (f) need for any project adjustments or reallocation of funds to improve performance. At least three-months prior to the mid-term review, the PMU will provide the Bank with a project progress report with

updated results indicators (as in Annex 1), project cost estimates, and plans for completion. This report will be reviewed with the World Bank and NWRC Project Steering Committee to help the PMU take measures required to ensure the efficient use of the resources and achievement of the Project Development Objective.

79. The PMU's M&E consultant, in consultation with the PMU and the Bank, will design and conduct baseline and endline surveys covering river traffic, carrying capacities and river accidents/incidents in selected stretches; flood warning systems and procedures (timeliness and accuracy); accuracy and timeliness of weather forecasts (using standard WMO procedures); and, user satisfaction with DMH services. The M&E system will also assess project impacts on nearby communities including the socio-economic impacts of navigation enhancement works and compliance with environmental and social safeguards. Potential negative impacts related to loss of land and property, changed access to the river, impacts on fishing livelihoods, and changed sedimentation and river bank erosion patterns will require regular assessment. The Consultant will support the PMU to evaluate the distribution of impacts/benefits particularly for women, the poor and ethnic minorities and recommend necessary actions to ensure they are not disadvantaged.

80. A number of survey instruments will need to be developed and tested along with their sampling methodologies. These include traffic surveys by type of vessel, cargo and passenger volume surveys, origin-destination surveys, user surveys of hydromet information and DMH services, and a household survey for selected riverside communities where stream bed enhancements are proposed. Robust sampling methodologies will need to be designed for the surveys to yield valid and representative findings. The objectives of each survey question must be clearly determined and the questions should be designed to collect information on indicators that can assess outcomes and impacts. The Consultant will assist the PMU to develop an M&E plan to address the above requirements. The plan should include a simple but effective evaluation strategy within which to design the baseline and endline surveys and conduct any other targeted studies deemed necessary.

81. The World Bank Group will undertake regular six monthly supervision missions, specialist monitoring missions (as required) and random site visits to evaluate performance and to confirm that social and environmental safeguards are followed. They will also conduct a mid-term review in 2017 to evaluate all aspects of the project. Independent external financial audits will be conducted annually.

E. Sustainability

82. The long-term sustainability of the project's benefits depends largely on the design, introduction and effective functioning of institutional, regulatory and planning systems reforms in Component 1. The project has therefore been designed to support robust institutional reforms, provide the capital funds and technical assistance needed to effectively launch and enable the newly decreed NWRC agencies, and to provide these agencies with the information systems needed to support decision-making for the sustainable use of the country's water resources. As part of the institutional review and reforms activities, business and staffing plans will be produced for the NWRC agencies to strengthen sustainability.

83. The sustainability of the hydromet modernization investments in Component 2 will ultimately rest on their design and the demand for the services they provide. Hydromet projects in developing countries have a weak record of sustainability. Designing an appropriate system with equipment well-suited to the geography, needs and capacities of the country is essential. Technical assistance from a Systems Integrator Consultant should help strengthen sustainability in this regard by backstopping technical design and providing operational support throughout the full implementation period of the project. The consultant will also make an assessment of O&M requirements and overall sustainability of the proposed designs. In addition, the project emphasizes the need to transform the DMH into a modern service-oriented agency, delivering products of immediate value to a wide range of users. It is the demand for useful end-products from other government agencies and the public at large that will ensure the long term sustainability of the investment. Many hydromet projects have failed due to a focus on data collection only. Unless data are analyzed and transformed into actionable information, there is little appreciation of their value, and hence little demand. The project has therefore been designed to transform the current system from a traditional data gathering organization into one that is modernized, affordable and service-oriented.

84. The GoM will ensure adequate allocation of budget and technical staff to sustainably operate and maintain the proposed investments over the longer-term. In addition, new skills may be needed in DMH to run the modernized hydromet and forecasting systems, and in DWIR to operate sonar and safety equipment. Capacity building and training activities supported by the project are designed to strengthen the technical capacity to sustain project investments but additional staffing may also be required.

85. Sustainability of Component 3 investments will be ensured by the DWIR. The sustainability objective of this component relates not only to the channel enhancement works but also to capacity development of the DWIR; from the identification of the investment list to the designing of works, to the construction and maintenance of works after construction is completed. To this end, DWIR staff will be encouraged to join the various Consultants teams undertaking the river navigation studies, the preparation of detailed design documents and construction supervision. Furthermore, Force Account (works implemented by the Client) will be applied for both the construction of training works and the installation of the navigation aids. Provision of the equipment needed for waterways operations and management will also be included under the component to ensure the efficiency as well as the sustainability of the investment.

F. Role of Partners

86. The World Bank will collaborate and coordinate with other development partners working in the areas of water resources management, disaster risk management and inland water transport. Ongoing areas of collaboration include the following:

Navigation. The feasibility study of the channel enhancement works and detailed design for about 30km on the river stretch from Mandalay to Nyaung Oo will be financed and carried out by The Netherlands.

Capacity Building. The Netherlands is currently undertaking a needs assessment for capacity building in water resources management. That report will provide guidance for prioritization of the capacity building funds made available under this project, as well as providing guidance on appropriate, transparent processes for the selection of individuals.

Integrated Water Resources Management (IWRM) Strategy. The Netherlands is currently developing an IWRM strategy that will identify and prioritize key IWRM investments for Myanmar. The results of the Dutch IWRM Strategy will provide input to the Ayeyarwady River Basin Planning Framework exercise (activity 1.1.a) and help identify promising investments for consideration in a second phase AIRBM investment.

Hydromet Modernization. Coordination with JICA will be a priority on Component 2 as they are making a significant investment (about US\$40M) in Myanmar's severe weather warning systems. JICA investments include the introduction of Doppler radar meteorology and other modern techniques. The AIRBM and JICA programs have agreed to coordinate closely to modernize DMH systems. The operational system to be developed by the WB project will fully integrate the design of the future Doppler radar sub-system which is critical for now-casting and issuing disaster alerts and warnings. It was also agreed that regular information exchanges between WB and JICA/JMA teams would be established and relevant technical details would be provided in the future, subject to mutual agreement.

Support to DMH. The World Bank team initiated consultations with WMO and USAID officials who expressed interest in providing assistance to DMH, and a WMO official participated in the Project's pre-appraisal mission in August 2014. Potential areas of support have been discussed with DMH including undertaking a detailed institutional assessment of DMH (SWOT analysis), developing potential long-term strategies and exploring modalities for future "twinning" arrangements with WMO. Scaling up DMH participation in WMO initiatives such as the Global Framework of Climate Services (GFCS) and the Severe Weather Forecast Demonstration Project and Flash Flood Guidance Projects will be facilitated by WMO. Additional training and capacity building support for DMH in priority areas such as aviation safety were also recommended for consideration.

Other donors that are undertaking complementary activities and with whom coordination will continue include Finland, Germany, Korea, Norway, Switzerland, ADB and UNDP.

Annex 4
Operational Risk Assessment Framework (ORAF)
Myanmar: Ayeyarwady Integrated River Basin Management Project (P146482)

Project Stakeholder Risks						
Stakeholder Risk	Rating	Substantial				
<p>Risk Description:</p> <p>The WBG is beginning activities in an uncertain operating environment. After two decades of absence from Myanmar, there is a need for the WBG to better understand the Myanmar context, and for Myanmar counterparts to become more familiar with WBG processes.</p> <p>It is unclear whether the economic and political reform process could be sustained beyond the direct involvement of key players. Political uncertainties in the run up to the 2015 elections, the newness of the reform process, and the potential for increased domestic tension as new openness allows for previously suppressed grievances to surface, all pose stakeholder risks.</p>	<p>Risk Management:</p> <p>The WBG recently completed a Public Expenditure and Financial Accountability Assessment and a Public Expenditure Review with the Ministry of Finance and Revenue and development partners. This will help partners better understand the public financial management and procurement systems, and identify areas for technical support.</p> <p>The WBG aims to support a move from individuals to institutions, including a focus on strengthening and working through government systems, and supporting civil society and processes that can help to reconnect the population with government authorities, especially at the local level.</p>					
	Resp:	Status:	Stage:	Recurrent:	Due Date:	Frequency:
	Both	In Progress	Both	<input checked="" type="checkbox"/>		Continuous
Implementing Agency (IA) Risks (including Fiduciary Risks)						
Capacity	Rating	High				
<p>Risk Description:</p> <p>While the implementing agency (DWIR) has technical and engineering capacity (DWIR also has experience in implementing large-scale international contracts), they are unfamiliar with the current Bank financial management (FM), procurement, safeguards, and M&E procedures and policies.</p> <p>Financial Management: DWIR has FM with staff with</p>	<p>Risk Management:</p> <p>The project will allocate funding for technical assistance (international and national consultants) and carry out capacity building activities to support the DWIR and DMH during project implementation. Key areas for capacity building include financial management, procurement, design and implementation of environmental and social safeguards, monitoring and evaluation, and communications.</p> <p>The implementing agencies will also be provided training by the Bank’s FM Specialists and Disbursement Specialists to ensure that adequate capacity is available throughout</p>					

good finance and accounting knowledge, but no experience with the WBG's FM policies and procedures.

Procurement: There are currently no national regulations and guidelines on public procurement. DWIR have no experience with the WBG procurement procedures. They also have very limited experience with procurement processes, particularly when it comes to specialized technical equipment (which will be required for the hydromet modernization component). As a result, delay in procurement of goods and services may be expected. In addition, the slow bureaucratic procurement procedures may also contribute to the delay. All current procurement of river basin civil works is done using their own resource including labor and machinery.

Safeguards: DWIR and DMH have no prior experience with implementing WBG's environmental and social safeguards.

the implementation period. The FMIS will be used to process and report project transactions, as well as to ensure compliance with WBG policies and procedures. Qualified FM consultant(s) and external auditor(s) will be hired to support the existing finance division staff. Internal and external audits will be conducted as part of the implementation requirements.

The project will train DWIR procurement staff on the WBG's procurement procedures and documentation requirements. Funds will be made available for additional technical assistant, supervision and consultant support to ensure smooth implementation, particularly in the early stages of the project. An M&E system will be developed and used to ensure timely and quality delivery of investments. For procuring specialized equipment (hydromet modernization), supply and installation packages will be explored to mitigate issues resulting in procurement delays. Finally, the WBG will regularly conduct procurement post review.

The safeguards capacity risk will be mitigated by ensuring that DWIR and DMH have sufficient technical assistance and expert consultants to support safeguards implementation and M&E processes, in accordance to the WBG's procedure. Capacity building and institutional strengthening of DWIR and other relevant agencies involved in project implementation will be supported by the project.

Resp:	Status:	Stage:	Recurrent:	Due Date:	Frequency:
Client	In Progress	Both	<input checked="" type="checkbox"/>		Continuous

Governance

Rating High

Risk Description:

Based on the recent governance assessment for Myanmar, the key risks are associated with the lack of transparency, emphasis on top-down accountability, limited institutional accountability and weak voice.

Project activities and river basin management more generally require effective coordination between a range of government agencies and donor programs, as well as NGOs and the private sector. Multi-sector and multi-donor coordination is always challenging, and may be especially so in Myanmar, where capacities and information availability are low.

Risk Management:

The project will integrate governance, accountability and transparency measures into the project design. Internal audits will be carried out on a semi-annual basis to review the FM and expenditures incurred. In addition, to promote transparency, the PIM, audited financial statements, FM and procurement documents and the ESMP will be published on the project website for public access. Finally, a communications strategy will be developed to ensure project information reaches the public and that a formal feedback mechanism is in place to strengthen the voices of the local communities.

Component 1 of the project is designed explicitly to promote coordination through strengthening of the NWRC technical and institutional capacity. A Program Steering Committee has been established to support effective coordination across sectors. The process of staffing the NWRC Secretariat will put in place a mechanism to ensure staff are selected based on merit and are supported with effective training. The Water

Framework Directive and Water Law, currently under active consideration, will also ensure that the NWRC have the appropriate legal and administrative backing.					
Resp: Client	Status: In Progress	Stage: Both	Recurrent: <input checked="" type="checkbox"/>	Due Date:	Frequency: Continuous
Risk Management: To mitigate the risks, the fraud and corruption clauses in the WBG's Procurement Guidelines will be included in the bidding documents, request for proposals, and contracts financed by the project. The World Bank team will conduct close M&E and implementation support in order to help minimize procurement and FM complications.					
Resp: Client	Status: In Progress	Stage: Both	Recurrent: <input checked="" type="checkbox"/>	Due Date:	Frequency: Continuous

Project Risks

Design	Rating	Substantial
<p>Risk Description:</p> <p>The main project risk is related to the rapid pace of change and related pressure to develop the Ayeyarwady River without due regard for integrated and coordinated management.</p> <p>The project is complex and includes multiple types of investments, implementing Departments and stakeholders.</p> <p>The lack of adequate data related to the Ayeyarwady River also poses a risk to the development of the decision support system and basin-wide analyses.</p> <p>Due to the lack of prior experience in Myanmar, risks could arise in designing an integrated, modern hydromet system and related information management and communications systems.</p>	<p>Risk Management:</p> <p>The project is designed to support the newly formed NWRC to strengthen its effectiveness in leading development of the Ayeyarwady Basin and Myanmar's water resources more broadly. The development of a strong decision support system will provide the NWRC with robust information to enable evidence-based debate among various stakeholders on the river in order to align and balance interests, avoid foreclosing future development options, and promote better development outcomes. Moreover the Preparation of Future Investments sub-component will provide an incentive for proponents of large investment projects to work within the NWRC framework to identify, design and prepare projects in an integrated way and to international standards.</p> <p>Responsibilities of each implementing unit will be clearly defined in the PIM. In addition, the project is designed to help strengthen the newly formed NWRC's capacity and effectiveness to lead the development, coordination and planning efforts in the Ayeyarwady River Basin, as well as in Myanmar as a whole.</p> <p>The project invests in Myanmar's hydromet system to ensure progressively better primary data will be available. In the meantime, remotely sensed data will be used to fill the data gaps.</p>	

	To mitigate the hydromet modernization design risk, a specialized consulting company will be hired as a Systems Integrator to provide support to DMH throughout the implementation period. The consulting company will provide technical support and train the DMH staff.					
	Resp: Client	Status: In Progress	Stage: Preparation	Recurrent: <input checked="" type="checkbox"/>	Due Date:	Frequency: Continuous
Social and Environmental	Rating	High				
Risk Description: The institutional and legislative framework for implementing environmental and social safeguards in Myanmar is weak and institutional capacity is very limited. With regard to the Ayeyarwady River Basin specifically, existing knowledge and data on environmental and social issues is scarce or non-existent. The proposed civil works will have impacts on downstream water quality and turbidity, aquatic habitats, aquatic flora and fauna, fishery and users of the river. The transport and disposal of dredged materials may have impacts on navigational traffic and safety. Social impacts may result from land acquisition. The PFI will include feasibility and other studies of infrastructures related to the development of the Ayeyarwady River Basin that may include hydropower, irrigation and water treatment as potential future investments. Furthermore, the SESA will provide inputs for the management of environmental and social impacts within the River Basin Master Plan and Decision Support System which cover over half the territory of Myanmar.	Risk Management: In Myanmar today, safeguards are being managed largely by the Ministry of Environment, Conservation and Forestry through an Inter-Ministerial team that includes the AIRBM Project Director. Building on this Inter-Ministerial effort and the NWRC mandate the project will support training for all agencies undertaking water related projects, to strengthen capacity to screen, review and monitor water-related investments for environment and social impacts. Component 1 of the project will also strengthen regulations through review of water management functions across the government and relevant environmental and social safeguards regulations. Furthermore, the ESMF was developed to provide: (i) the development of a knowledge base and risk management mechanisms, (ii) the establishment of communications and consultation channels with stakeholders; and (iii) identification of risks and impact mitigation measures. Consultations with stakeholders including civil society were held at both the TOR and the draft report stages of the ESMF. Funds will be allocated to finance technical assistance and consultant support for the implementation and M&E of safeguards. The WB will closely monitor safeguards progress to ensure compliance with the WB's procedures. Furthermore, an institutional capacity and capacity building plan will be developed during implementation. The SESA that will be developed in parallel with the basin Master Plan will gather information on baseline and social conditions that will allow identification and better assessment of cumulative impacts in the basin from all current and planned investments. Site specific ESMPs will be implemented for works by contractors and their compliance supervised by CMUs.					
	Resp: Client	Status: In Progress	Stage: Both	Recurrent: <input checked="" type="checkbox"/>	Due Date:	Frequency: Continuous
Program and Donor	Rating	Moderate				
Risk Description:	Risk Management:					

<p>Due to its recent government reforms and international engagement, several donors are initiating ambitious development programs through government systems. The risk is that DWIR, among other agencies, may become overwhelmed by different donor financing modalities, procedures, and requirements. Further, rapid scaling-up of international assistance to Myanmar may pose donor coordination challenges among the donors and implementation agencies.</p>	<p>The WBG is engaging with development partners to share lessons from project design and implementation. Efforts are also being made to strengthen coordination among donors to mitigate redundancy in work as well as to promote long-term sustainability of investments. Component 1 of the project has also been explicitly designed to improve coordination across different water agencies, donors and investors, through strengthening of the NWRC institutional and technical capacity, as discussed above. During implementation, the WBG will coordinate its support closely with other donors and development partners to avoid redundancy. Initial collaboration, specifically with the Netherlands, Australia, Japan, Norway and Korea has been very positive and will be sustained.</p>					
	Resp: Bank	Status: In Progress	Stage: Preparation	Recurrent: <input checked="" type="checkbox"/>	Due Date:	Frequency: Continuous
Delivery Monitoring and Sustainability	Rating	Substantial				
<p>Risk Description:</p> <p>Unfamiliarity with WBG operational policies and procedures may lead to delays in project implementation and reporting.</p> <p>The sustainability of investments in hydromet is often weak.</p> <p>Project investments may not be sustainable beyond project life if there is insufficient capacity and resources (monetary and human) for operation and maintenance.</p>	<p>Risk Management:</p> <p>Funds will be allocated to provide technical assistance and consultant support to the implementation agencies in order to reduce delay in project implementation and reporting.</p> <p>The hydromet program will be designed to provide services to users, to ensure continued demand and hence strengthen sustainability. In addition, the Results Framework will monitor the % obtained of an agreed target for sustainable staffing and budget of the DMH.</p> <p>The project is designed as the first in a series of projects as it recognizes the large number of interconnected issues that will need long-term planning and engagement. From the first project onwards, however, sustainability issues are built into activities by focusing on strengthening institutions and inclusion of capacity building activities. In addition, during preparation, agreement has been reached with the GoM to ensure adequate allocation of budget and technical staff to sustainably operate and maintain the investments over the longer-term.</p>					
	Resp: Client	Status: In Progress	Stage: Both	Recurrent: <input checked="" type="checkbox"/>	Due Date:	Frequency: Continuous

Overall Risk

Overall Implementation Risk:

Rating

High

Risk Description:

The WBG will undertake intensive implementation support throughout the project implementation to ensure compliance with the mitigation measures outlined above.

Annex 5: Implementation Support Plan

MYANMAR: Ayeyarwady Integrated River Basin Management Project

Strategy and Approach for Implementation Support

1. The project activities financed by the Ayeyarwady Integrated River Basin Management Project (AIRBM) will start in March 31, 2015 and is planned to be completed by March 31, 2020. The IDA Credit is scheduled to close on September 30, 2020.
2. The strategy for implementation support focuses on the implementation of the risk mitigation measures defined in the ORAF and aims at making implementation support to the client flexible and effective. It also seeks to provide the technical advice necessary to facilitate achievement of the PDOs (linked to outcomes identified in the result framework) and to meet the requirements of the Bank's fiduciary obligations. The implementation support strategy includes:
 - (a) **Project Management:** The Bank task team will closely monitor the capacities of the project and component management teams throughout the implementation period to ensure adequacy. In particular, implementation support will be provided to the PMU (Component 1) and CMUs (Components 1, 2 and 3) in recognition of the fact that this is the first engagement with the WBG for these implementing agencies. Where needed, additional training will be provided in relation to the Bank fiduciary and reporting requirements, as well as in the areas of environmental and social safeguards management. The World Bank team will also maintain regular contact with key officials of DWIR and DMH to ensure timely identification of any potential problems and their solutions.
 - (b) **Procurement:** Implementation support will include: (a) procurement training for the implementing agencies staff; (b) hiring of procurement specialists to support the AIRBM; (c) reviewing and providing feedback on the procurement documents to the implementation agency; (d) providing the Government with detailed guidance on the Bank's Procurement Guidelines; (e) monitoring of procurement progress against the detailed Procurement Plan; and (f) providing any other just-in-time training and support at key moments in the procurement cycle. During the first 12 months of project implementation, close support will be provided to the implementation agencies to ensure timely procurement and contracting of critical large, technical procurement packages. In particular, TORs are being developed prior to project launch for the Ayeyarwady Basin Master Plan and Decision Support System (Component 1) and the Systems Integrator (Component 2).
 - (c) **Financial management:** Implementation support will include: (a) review of Myanmar's financial management system, including but not limited to, accounting, reporting and internal controls; (b) hiring of financial management specialists to support the AIRBM; (c) providing training as needed to the implementing agency; and (d) reviewing and providing feedback on the financial reports to the implementation agencies. The Bank team will also assist the DWIR and DMH in improving financial management and reporting. Financial management supervision will be conducted by financial management specialists.

- (d) **Safeguards:** The World Bank will provide enhanced review support for quarterly or semi-annual environmental monitoring and evaluation reporting based upon needs discussed and agreed upon with counterparts. It will also provide feedback and follow up with the implementing agencies and consultants on any issues identified. Given the very low institutional capacity and underdeveloped regulatory regime for environmental and social safeguards (currently the Ministry of Environment Conservation and Forestry is drafting the EIA guideline for the country), the Bank team, including environmental and social specialists, will provide enhanced safeguards support to the implementing agencies.
- (e) **Implementation Progress:** The Bank will closely monitor the overall progress of project implementation by providing reviews of the semi-annual progress reports, the execution of the Procurement Plan, and the actual disbursement of the IDA credit. The Bank will also provide support through regular supervision missions to help the implementing agencies identify and address any issues that may arise to ensure timely project progress.

Implementation Support Plan

3. This operation will require fairly intensive supervision, especially during the first two years of implementation. Myanmar has limited experience in implementing World Bank financed projects and the AIRBM has a relatively complex implementation structure as it cuts across a range of activities, including hydromet modernization. The Bank's supervision team members will therefore be made available to provide timely, efficient and effective implementation support to the clients throughout the implementation period.
4. Formal supervision and field visits will be carried out at least four times annually during the first two years of implementation. In the later years, the World Bank will carry out two to three formal supervision and field visits. The visits will be complemented by ongoing communications and telephone and video conferences as needed to discuss project progress and to address any issues that may arise. Detailed inputs from the World Bank task team are outlined below:
 - (a) **Technical inputs:** Technical specialists will support the efforts of the PMU and CMUs by providing support to review bid documents and associated technical specifications to ensure the proposed work meets the technical standards and enables fair competition. Technical specialists will also provide support to review bid evaluation documents as well as monitor project implementation during construction and commissioning.
 - (b) **Fiduciary requirements and inputs:** The Bank team will support the implementing agencies to identify capacity building needs with the aim to strengthen financial management capacity and improve procurement management efficiency. Training will be provided by the World Bank's financial management and procurement specialists as needed. The financial management and procurement specialists will be based in the region to provide timely support. Formal supervision of financial management will be carried out semi-annually, while formal supervision of procurement will be carried out based on the client's needs.

- (c) **Safeguards:** Inputs from the World Bank environment and social specialists will be provided based on the client’s needs. The support will focus on institutional capacity building for environmental and social safeguards at the project level, ensuring that environmental and social concerns are reflected in all sub-projects including studies financed under the PFI, and monitoring performance of the environmental and social management plans. In addition, specialists will support the government’s final design and implementation of the SESA to be carried out under Component 1. Quarterly or semi-annual safeguards field visits are expected during the first 18-24 month of project implementation depending on project needs.
- (d) **Institutions and sector policies:** Sector level risks will be addressed through policy dialogue with the governments’ Ministries and agencies. To help address the important issue of water sector fragmentation, the World Bank will provide, through its staff and consultants as needed, support to help strengthen the NWRC’s capacity to coordinate activities and to manage competing demands across the government agencies. It will also provide technical experts to help review drafts of new sectoral policies and laws being developed with support under Component 1. Given the early stage of the Bank re-engagement in the water sector and the complex reform agenda facing the Government in this sector, Bank sector specialists are expected to visit the country frequently (on a quarterly basis) during the first 18 months of the project implementation, and semiannually thereafter.

5. The main focus of implementation support is summarized below:

<i>Time</i>	<i>Focus</i>
<i>First twelve months</i>	Finalization of Technical TORs Legal, FM & procurement arrangements Begin procurement Capacity building for environmental & social safeguards
<i>12-48 months</i>	Conduct procurement Monitor project implementation, including construction progress Monitor FM and disbursement Monitor performance of environmental and social management plan
<i>Years 2-5</i>	Monitor project implementation, including construction progress. Monitor financial management and disbursement Monitor performance of environmental and social management plan

Estimated Annual Cost of Project Supervision

Postion	Source	Weeks	Variable Costs	Mission Costs	Total
Task Team Leader	Staff	12	0	\$ 10,000	\$ 10,000
Co-Task Team Leader	Staff	10	0	\$ 10,000	\$ 10,000
Procurement Specialiast	Staff	6	0	\$ 5,000	\$ 5,000
FM Specialist	Staff	6	0	\$ 5,000	\$ 5,000
Environment Specialist	Staff	6	0	\$ 5,000	\$ 5,000
Social Specialist	Staff	6	0	\$ 5,000	\$ 5,000
Hydro-Met Specialist	Staff	6	0	\$ 10,000	\$ 10,000
Navigation Specialist	Staff	6	0	\$ 5,000	\$ 5,000
				Sub-Total	55000
River Basin Specialist	Consultant	4	\$ 12,000	\$ 6,000	\$ 18,000
Legal Specialist	Consultant	4	\$ 12,000	\$ 6,000	\$ 18,000
Environment Specialist	Consultant	4	\$ 12,000	\$ 6,000	\$ 18,000
Social Specialist	Consultant	4	\$ 12,000	\$ 6,000	\$ 18,000
Other Technical Specialist	Consultant	4	\$ 12,000	\$ 6,000	\$ 18,000
				Sub-Total	\$ 90,000

The above cost estimates are based on annual, average anticipated supervision requirements, and will vary from year to year. It is expected the core Bank supervision team will need approximately \$55,000 per year in variable costs from the Bank budget. The Bank team will also seek grant funds, or selectively use the Bank budget, to complement the team and bolster its capacity with international consultants. The ISP will be reviewed at least once a year to ensure that its meets the project requirements.

Annex 6: Economic and Financial Analysis

1. Significant economic benefits are expected to result from the project's investments in institutional strengthening, hydromet, forecasts and warnings systems enhancements, and navigation improvements.

Component 1: Water Resource Management Institutions, Decision Support Systems and Capacity Building

2. This component is expected to help the government make better informed investment decisions and avoid potentially significant losses associated with large-scale long-lived investments that have unintended consequences and/or foreclose better development options. In addition, the Preparation of Future Investments (PFI) financing will increase the government's capacity to plan and prepare investments more efficiently and up to international quality standards. It is anticipated that as a consequence, there will be a reduction in the economic and social benefits foregone as a result of the delayed preparation of projects or weak project design and appraisal. The benefits associated with this component, however, are difficult to quantify and are therefore not included in the economic assessment.

Component 2: Hydro-meteorological Observation and Information Systems Modernization

3. Context and Comparators. Floods, storms and tsunamis accounted for seven of Myanmar's ten most devastating natural disasters and 99 percent of all deaths recorded from natural disasters.⁸ An average of roughly 58,000 persons are affected each year by flood, storm and tsunamis in Myanmar with damages averaging over \$40 million annually.⁹ Modernized hydromet monitoring, forecast and warning systems could help reduce the impacts of all of these events.

4. Investments in hydromet systems and services are rapidly becoming priority investments for climate adaptation, particularly in countries like Myanmar that are highly dependent on rainfed agriculture and extremely vulnerable to extreme weather. In addition to direct impacts, natural disasters can have long lasting indirect consequences when assets are lost or health is undermined leaving households and/or communities significantly disadvantaged. Methodologies to assess the economic benefits of hydromet investments are still evolving. The broad range of estimates currently in the literature suggest that these investments can be extremely beneficial in terms of averting losses associated with climate hazards and enhancing the productivity of climate-dependent sectors such as agriculture, hydropower and transport.

5. Global studies have found high returns to investment in hydromet. Hallegatte (2012)¹⁰ estimated the potential benefits of upgrading all developing country hydro-meteorological

⁸ EM-DAT database.

⁹ EM-DAT database.

¹⁰ Hallegatte, Stéphane, 2012. *A Cost Effective Solution to Reduce Disaster Losses in Developing Countries: Hydro-Meteorological Services, Early Warning, and Evacuation*, World Bank Policy Research Working Paper #6058.

information production and early warning capacities to developed-country standards. Total benefits were estimated to be between US\$4 and US\$36 billion per year globally, with benefit-cost ratios between 4 and 36. Country specific analyses find benefit-cost ratios across a similar range:

- China: benefit-cost ratio for 1994-1996 of 35-40¹¹
- Mozambique: benefit-cost ratio of 70 for investment in meteorological services¹²
- US: benefit-ratio of 6 for forecasting¹³
- Russia: benefit-cost ratio of 4.5-10¹⁴
- Kyrgyz Republic: benefit-cost ratio of 2¹⁵
- Tajikistan: benefit-cost ratio of 2.2¹⁶

6. In Myanmar significant benefits are anticipated to accrue from hydromet modernization both from reduced disaster losses and enhanced productivity, particularly in agriculture. Myanmar's current hydromet observation, forecast and warning systems are rudimentary, which leaves great potential for diminishing the loss of lives, livelihoods and assets in this highly climate-vulnerable country. Similarly, there are no official seasonal forecasts or timely planting and harvesting advisories that could enhance the productivity of farmers, particularly as climate change undermines the predictive value of historical climate knowledge and associated traditional practices. These key new services would be delivered under this Project.

7. Reliable systematic data on losses associated with natural disasters are unavailable in Myanmar, however global data sets such as EM-DAT provide basic country data and a significant amount of data was collected after cyclone Nargis.

8. Using the best available information, two methodologies have been applied to broadly assess the economics of a transformational investment in Myanmar's hydromet and forecasting services. To assess the economics of the hydromet investment (Component 2) of this project, two methodologies were applied: (i) a global benchmarking methodology; and (ii) a sector specific/empirical methodology.

9. Global Benchmarking Methodology. The benchmarking methodology follows Hallegatte (2012).¹⁷ This methodology for calculating the potential benefits of investment in hydromet services and early warning is based on a country's GDP and current level of hydromet and warning capacity. The methodology points out that to achieve the assumed benefits. Investment

¹¹ Guocai, Z and H. Wang, 2003. *Evaluating the Value of Meteorological Services in China*. WMO Bulletin 53(4): 383-7.

¹² World Bank, 2008. *Weather and Climate Services in Europe and Central Asia: A Regional Review*. Working Paper 151.

¹³ Rogers and Tsirkunov, 2010. *Costs and Benefits of Early Warning Systems*. Global Assessment Report on Disaster Risk Reduction. ISDR and the World Bank.

¹⁴ World Bank, 2005. *Russia National Hydromet Modernization Project*. Project Appraisal Document.

¹⁵ World Bank, 2009. *Improving Weather, Climate and Hydrological Services Delivery in Central Asia (Kyrgyz Republic, Republic of Tajikistan and Turkmenistan)*.

¹⁶ Ibid.

¹⁷ Tsirkunov, V. and S. Ulatov, M. Smetanina, A. Korshunov (2008)

would be required in: (1) local observation systems; (2) local forecast capacity; (3) increased capacity to interpret forecasts and translate them into warnings; (4) communication tools to distribute and disseminate information, data, and warnings; and (5) institutional capacity building and increased decision-making capacity by the users of warnings and hydro-meteorological information. The current project will deliver significant investment in all of these critical areas.

10. Three categories of benefits are examined (two of which are quantified):

- Assets: Reduced asset losses from disasters
- Productivity enhancement: Other economic benefits
- Lives: Reduced human losses from disasters

11. *Reduced Losses/Assets.* Hallegatte found that well functioning, modern early warning systems reduce disaster-related asset losses by between 0.003 percent (which is described as a ‘low estimate’) and 0.017 percent (which is described as a ‘likely estimate’) of GDP. He posits that the potential benefit of an investment in hydromet and warning systems is therefore the difference between the current protection provided by hydromet and forecasting systems in a country, and the potential reduction in asset losses if the system were modernized.

12. For countries like Myanmar that are highly vulnerable to weather extremes, global benchmarks based on European information will likely be underestimates. Better hydromet, forecast and warning systems could also reduce indirect losses, and amplify benefits. We can thus be confident that global benchmarks are a lower bound for Myanmar.

13. Under this benchmarking methodology Myanmar would be considered a low-income country with a weak system, and would therefore be assumed to capture only 10 percent of the asset-saving benefits achievable today in a country with a high functioning hydromet and warning system.

14. Potential benefits would therefore be calculated as the difference between the potential reduced losses (0.003 percent to 0.017 percent of GDP) and the actual reduced losses which in the case of Myanmar would be assumed to be 10 percent of that value, or a total of US\$1.5 - US\$8.5 million with the likely value being US\$8.5 million.

15. *Productivity Enhancement.* In addition to diminishing disaster losses, modernized hydromet systems can significantly enhance economic productivity in water- and climate-sensitive sectors. Modernized hydromet and warning systems can benefit these sectors in many ways – from immediate warnings, to seasonal agricultural advisories, to infrastructure design and spatial planning. Hallegatte’s global benchmark is that modern forecasts add value of 0.1 percent to 1 percent of GDP in weather-sensitive sectors. Globally, he finds that about 25 percent of world GDP is generated in climate sensitive sectors, i.e., agriculture, mining and energy, construction, and transport. In Myanmar, climate sensitive sectors represent a much larger share of the economy with agriculture alone represents about 37 percent of GDP. Conservatively assuming that climate sensitive sectors account for just 35 percent of Myanmar’s GDP, the value added from modern forecasts is estimated at US\$19.4 - US\$194 million annually.

16. *Lives.* This analysis does not attempt to assign a value to the lives potentially saved by this Project. It is clear, however, that the Project has significant potential to save lives. EM-DAT records suggest that over the period 1900-2014 an average of over 1,270 people a year were killed in floods, tsunamis and storms. These numbers include the impact of cyclone Nargis, in which an estimated 138,000 people perished.

17. *Benefit-Cost Ratio of the Benchmarking Analysis.* This conservative benchmarking analysis of the benefits of a modernized hydromet system in Myanmar suggests total returns of US\$21 - 200 million per year, and a benefit-cost ratio¹⁸ for the life of the project of 2.7 to 27.

18. *Sector Specific/Empirical Methodology.* Historical data (1900-2014) estimates economic damages from storms, floods and tsunamis averaging US\$41.3 million annually. Experience in other countries suggests that a conservative estimate of the benefits of a modernized system would be a reduction of 5-10 percent¹⁹ in economic damages caused by natural hazards. This would correspond to an average annual benefit of US\$2.0 – US\$4.1 million. This reflects only economic damages averted, it does not address morbidity or mortality, and is therefore very conservative.

19. The investments under this project would also help to enhance productivity for example, in agriculture, hydropower optimization and transportation. In addition it would provide the official data upon which climate risk insurance or agricultural insurance schemes could be built to enhance the resilience of farmers, and encourage greater investment and risk taking to improve agricultural productivity.

20. The Project's focused effort to provide productivity enhancing information directly to farmers can be expected to increase agricultural output by 0.5 percent to 1 percent from its current low base. If agriculture's share of GDP is 37 percent then agricultural output is US\$20 billion. Looking only at agricultural benefits, an increase in productivity of 0.5 percent to 1 percent would correspond to benefits ranging from US\$101 - \$203 million.

21. *Benefit-Cost Ratio of the Sector Specific/Empirical Analysis.* Taking into account only the benefits from natural disaster losses averted and enhanced agricultural productivity, economic benefits would be US\$103 -US\$207 million per year, and yield a benefit-cost ratio²⁰ of 14 – 28.

22. Given the scarcity of information and complexity of valuing the economic benefits of hydromet and forecast modernization in Myanmar, two different methodologies were applied in the economic analysis of this Project. Both suggest that investment is economically attractive with benefit-cost ratios, as below:

23.

¹⁸ Assumes a 15-year time horizon, replacement costs equivalent to 10 percent of investment costs after the project investment period, and an incremental operating and maintenance budget.

¹⁹ This corresponds to the anticipated decline in losses associated with a similar World Bank investment in Russia.

²⁰ Assuming a 15-year time horizon, replacement costs equivalent to percent of investment costs after the project investment period, and a full operating budget of US\$3 million.

Methodology	Benefit-Cost Ratio
Global Benchmarking	2.7 – 27.2
Sector Specific/Empirical	14.3 – 28.6

Component 3: Navigation Enhancement on the Ayeyarwady River

24. Investments in channel enhancements are also anticipated to provide strong returns. The most detailed information available on this issue is a 1988 navigation study of the Ayeyarwady by Royal Haskoning²¹ which provides an in-depth analysis of navigation demands, constraints and costs. The study found that the only physical constraints to navigation were the draft limitations at specific river locations during the low water season and that these could be largely alleviated with minor civil works. Furthermore it was estimated that simply enabling night navigation (installing lights, providing better information and mapping based on sophisticated bathymetry) could increase transport carrying capacity by 38 percent. The report therefore recommended a package of investments in night navigation and channel enhancements like those in the proposed project. Virtually none of the recommended work has been carried out in the interim so these benefits remain to be captured. The report estimated that for this package of improvements the financial internal rate of return would be 30.1 percent and the economic internal rate of return would be 29.3 percent.

25. More recent information confirms that demand continues to increase markedly. The Ministry of Transport with financing from JICA commissioned “The Survey Program for the National Transport Development Plan in the Republic of the Union of Myanmar” (2014) which includes some analysis of inland water transport. The report points to the urgent need for increased government investment in the transport sector. The report indicates that the GOM’s current expenditures on transport have averaged about 1 percent of GDP over the past five years, in comparison to 2-8 percent over the same period for peer Asian countries.

26. The survey identified inland water transport as a ‘most appropriate’ mode of transport²² for freight between national growth centers for distances of 300-600kms. It was estimated that by 2030 the development corridors that connect Yangon, Nay Pyi Taw and Mandalay will experience extremely heavy traffic demand, exceeding 100 million passenger-kilometers per day and 100 million ton-kilometers of daily freight. Inland water transport is particularly well suited to freight transport which now comprises mostly logs, construction materials, manufactured goods, food stuffs and fuel mainly between Yangon, Nay Pyi Taw and Mandalay.

27. More specifically, the survey delineated and prioritized transport corridors. The two corridors that correspond to the spatial area surrounding the navigable reaches of the Ayeyarwady River and its main tributaries (the Central North-South corridor and the Western North-South corridor) are both identified as priority corridors where demand for transport outstrips supply.

²¹ “Irrawaddy and Lower Chindwin Rivers Study” commissioned from Haskoning Royal Dutch Consulting Engineers and Architects for the Ministry of Transport and Communications Waterways Department by the World Bank and the UNDP (1988).

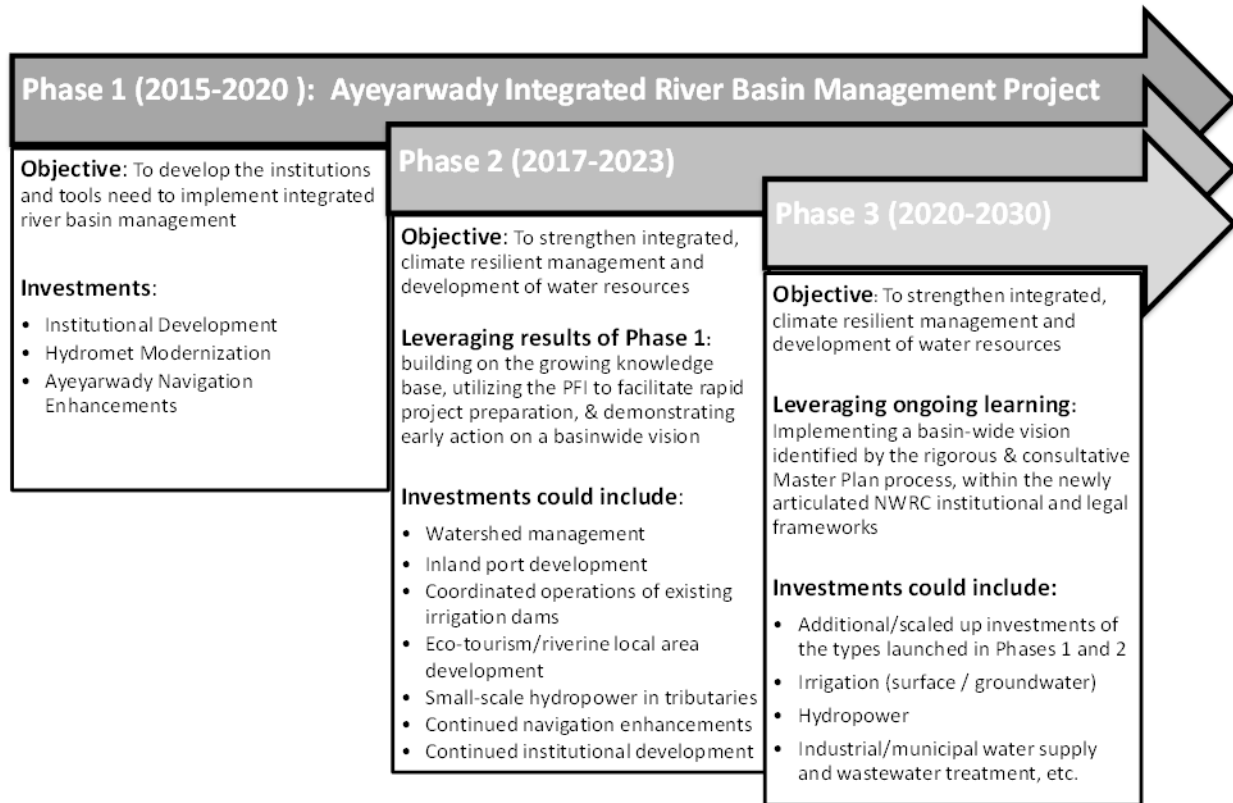
²² This ranking was also given to express highways and improved rail which are generally more costly to develop and to utilize.

28. The Central North-South Corridor accounts for 48 percent of all freight traffic and 55 percent of all passenger transport in the country using all modes of transport (road, rail and air in addition to inland waterways). Inland water transport represents 9 percent of this freight traffic and a small fraction of passenger traffic, but demand is rising. The volume of passenger and freight transport is projected to increase by over 10 percent per annum in this corridor.

29. The Western North-South Corridor explicitly includes river transport on the Ayeyarwady. In 2013, 11 million ton-kilometers of freight and 6 million passenger-kilometers were transported in this corridor, accounting for 12 percent of all freight traffic and 10 percent of all passenger traffic transported by all modes nationwide. Inland water transport accounted for 42 percent of this freight traffic. By 2030, demand in this corridor is projected to rise five-fold; to 52 ton-kilometers of freight and 32 million passenger-kilometers daily.

30. A feasibility study for the river enhancement works, which will include a detailed economic analysis of specific design options, will be undertaken as the first activity of project implementation. The strong returns on investment that were initially estimated for these interventions coupled with updated information suggesting a five-fold increase in the Ayeyarwady River corridor freight traffic over the coming 15 years suggests these investments should provide strong economic returns.

Annex 7: Schematic Overview of a Potential Overlapping Series of Projects



Note: The formal PDO for the Ayeyarwady Integrated River Basin Management Project is to contribute to the development of integrated river basin management on the Ayeyarwady River.

Annex 8: Project Map

