FRM Profile

Subproject	FRM-BDP-Padang
River basin	Belawan Ular Padang
Main river	Padang River
District/Province	North Sumatra
Agency in charge	BWS Sumatera II (BWS SII)
Proposed work description	The infrastructure components to be constructed along the Padang River system will allow i) reduction in flood water levels and ii) retention of flood volumes to reduce flood exposure to households and agriculture areas.
	The engineering consultant engaged under ADB Loan 3455 will prepare the detailed engineering design based on the agreed basic design and concept prepared under the TRTA. The L3455 will conduct detailed surveys (topography, geotechnical, bathymetry, social, and environmental) that might slightly impact on the design. No change on design that trigger category A for environment safeguards will be made.
	Flood Risk Management (FRM) plans shall be prepared and implemented at the river basin scale by reflecting national priorities/initiatives and international best practices (i.e., EU Flood Directive, WMO approaches and Prevention, Preparedness and Response to manmade and natural disasters (PPRD) East study). Some of the guiding principles are presented in Appendix D of the FRM technical pre-feasibility report to serve as the basis of developing Guidelines for FRM plans in Indonesia during development of detailed engineering design plans through L3455.
	Upstream Watershed Management practices will be described in further detail during the detailed engineering design stage (through L3455) in collaboration with the international project partner, International Fund for Agricultural Development (IFAD). In this context, site-specific actions will be evaluated and proposed, with the support of IFAD, to enhance stability and sediment yield characteristics in the upstream parts of the watershed. Some of the preliminary practices are described in Appendix E of the FRM technical pre-feasibility report to highlight joint functioning of various technologies as one system at the watershed scale.
	The main features of BWS SII proposals are described below.
	 BWS SII proposals for flood control and normalisation include: i) Flood walls along 37 km of Padang River from upstream to downstream (Subproject ID P2a1, P2a2, and P2a4) and 28 drain inlets (Subproject ID P2a3) (which has no design drawings) ii) Flood walls along 1.8 km of Kalembah River (Subproject ID P2b) iii) Floodway with 3.6 km of length from Bahilang River to Sigiling River (Subproject ID P2c1 and P2c2) iv) Flood control structures at Bahilang River (Subproject ID P2d1 and P2d2) v) River normalisation and enlargement along 11.9 km of Sigiling River for flood control (Subproject ID P2e1, P2e2, and P2e3).
	 EWSIP proposals for detention basins include: i) A flood control basin at upstream of Sungai Padang (Subproject ID P3a) (surface area of approx. 149.7 ha, depth of 18.9 m, and storage volume of 16.1 Mm3)
	ii) A small flood structure at upstream of Sungai Bahilang (Subproject ID P3b) (surface area of approx. 85.6 ha, depth of 7 m, and temporary storage volume of 3.9 Mm3)
	iii) River excavation at upstream to midstream of Sungai Padang (Subproject ID P3c) (excavation length approx. 8 km).
	 EWSIP future proposals for flood management include: i) North West Floodway at north west of Sungai Padang (Subproject ID P4a) which will redirect the additional flood flows between the 2020 and 2050 from Sibarau River and some flow from Padang River to the new floodway ii) Salinity protection dike at the coast of North West Floodway (Subproject ID P4b) to prevent ingress of saline flows.

EWSIP added	EWSIP	outputs are strategically linke	d to the BAF	PENAS quick-v	vin programs as
value	defined b	pelow:			
		BAPPENAS Programs	E Outrout 4: Dise	WSIP Outputs	
	Program	1: Smart Water Management	optimized	nning for water res	ources
	Program	2: Water for Food Security and	Output 2: RW	S infrastructure an	ıd
	Program	3. Multipurpose Storage for	Output 2: RW	S infrastructure an	nd
	Water, F	Food, Flood, and Energy	services impro	oved	
	Program Infrastru	i 4: Disaster Resilience cture	Output 3: FRM	A enhanced	
	Program Coastal	5: North Java Integrated	Output 3: FRM	A enhanced	
	Program	6: Green Infrastructure	Output 1: Plar optimized	nning for water res	ources
	Program	7: Water Safety Plan	Output 1: Plar	nning for water res	ources
Alignment with	The sub	project is consistent with the	spatial plan of	of North Sumatr	a Province year
spatial plan	2003-201	18'.			
Potential	The sub	projects are expected result in	Land Acquis	ition (LA) as do	cumented below.
Resettlement	to be imr	LA requirements for all subple	ngineering de	sign stage through	-specific surveys
impact			ngineening de	Estimate for	jii 20400.
mpaor	ID	FRM Subprojects	i	LA area (ha)	
		BWS SII Proposals]
	P2.a1	River banks (15m from river ban	k)	24	
	P2.a2 P2.a4	River banks (50m from river ban	k)	115	
	P2.a3	Drain structures (28 unit)		1.4	
	P2.c1 P2.e1	BH-S floodway & river enlargeme	ent	34.8	
		Sub-tota	al for BWS SII	175.2	
		EWSIP Proposals			
	P3.a	S Padang flood control basin		28	
	P3.b	S Bah Hilang FR embung		14	
		Sub-to	tal for EWSIP	42	
		Total estimate for lan	d acquisition	217.2]
	There a	re no documents on land	acquisition,	socio-economic	conditions and
	etc.).	nent needs along the project	corridor (i.e.,	AMDAL, LARP,	, LARAP, IP&IR,
Potential Indigenous People impact	The prel Indigeno	liminary findings indicate that us People (IP) area.	the propose	d subproject do	besn't cross any
	The final	status on the potential for cro	ossing areas v	vith IP should be	e evaluated by i)
	reviewing	g the BRWA (Indigenous T	erritory Regis	stration Agency) database ² , ii)
	reviewing	the AMAN (Indigenous Peopl	es Alliance of	the Archipelago) database ³ , and
	iii) site-sp	pecific surveys.			
Potential Environment	The sub biodivers	project works are not expected ity sanctuary or protected for	d to cross any est as indicat	y protected area ted in the Indica	a (forest/swamp), ative Moratorium
impact	Maps 15	th Revision, which are publishe	ed as per the l	Forestry Minister	rial Decree of the
	Republic	of Indonesia Number: SK	.8599/MENLH	IK-PKTL/IPSDH/	PLA.1/12/ 2018
	(Scale 1	$(250.000)^{-1}$. There are no doc	cuments on e	nvironmental im	pacts (i.e., IEE,
	AIVIDAL,	etc.). The potential to cross a	iny protected	area (torest/swa	imp), blodiversity
	Contract	y or protected totest should be or during Detailed Engineering	a Design No	ough sile-specili change on de	ic surveys by the
	category	A for environment safeguards	will be made.	, change on de	oign mat myyor

¹<u>http://perpustakaan.bappenas.go.id/lontar/opac/themes/bappenas4/templateDetail.jsp?id=13715&lok asi=lokal</u>, last accessed in June 2019.
²<u>http://brwa.or.id/sig/</u>, last accessed in June 2019.
³<u>http://www.aman.or.id/peta/</u>, last accessed in June 2019.
⁴<u>http://webgis.dephut.go.id:8080/kemenhut/index.php/en/map/pipib/61-pippib/330-indicative-moratorium-map-15th-revision</u>, last accessed in July 2019.

and implementation period The project costs include i) RpM 780,560 for the infrastructure by the BWS SII and ii) RpM 129,020 for the proposals by EWSIP. O&M costs are annual and to be calculated as 2% of infrastructure implementation costs through the lifecycle of proposed infrastructure over 30-years. DED is available for the infrastructure proposed along the Padang River by the BWS Sumatera II. Enhancement of the existing DED and Safeguards documentation will be proposed for preparation as part of ADB ESP packages (Loan 3455). The documents that are available include: i) DED (SID Pengendalian Banjir Sei Padang di Kabupaten Serdang Bedagai dan Tebing Tinggi, tahun 2013). The linkages between EWSIP and ESP That EWSIP are schematized below: Inter EWSIP are schematized below: Inter EWSIP and ESP Inter EWSIP and ESP Inter Structure () climate change projections, hydrodynamic modeling, satellite based wRM and enhanced FRM and STT subprojects, (iii) pre-feasibility reports for the FRMSTT subprojects, (iv) templates for Social and Environment Safeguards, (v) economic and financial analysis, and (vi) loan documents Inputs: BWS/BBWS/CK DED and EWSIP Pre-Feasibility Reports Outputs: DED, Safeguards (Social and Environment), LARP and EFA in selected river basins Inputs: ESP Design Inputs: FRM/STT Facilities constructed in selected river basins	Estimated cost	The implementation period is 2020 – 2025.
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Construction		•Outputs: FRM/STT Facilities constructed in selected river basins
		Construction

FRM Numerical Modelling Processes

Numerical models in IFRM	ESP Consultant shall follow the numerical modelling processes in integrated flood risk modelling (IFRM) as highlighted below:
	Climate Change Modelling - Scope: Climate change projections and anomalies - Database: Temperature, Precipitation and Evaporation (ADB)
	Hydrologic Modelling - Scope: Evaluation of Rainfall to Runoff processes - Database: Hydromet. network (BBWS/PUSAIR), LULC (ESA)
	Hydraulic Modelling - Scope: Evaluation of Runoff to River hydraulics (1D/2D) - Database: Flow gage network, DEM (BIG), Validatation (ESA)
	Erosion Modelling - Scope: Sediment yield from the watershed - Database: RUSLE / MUSLE parameters
	Sediment Yield and Watershed Management - Scope: Sediment yield along the watershed system - Database: Sediment characterization, FAO–WOCAT (World Overview of Conservation Approaches and Technologies)
Flood Hydrographs	ESP Consultant shall generate flood hydrographs (as depicted below) for existing/future conditions by using the Soil-Conservation-Service (SCS) Curve Number (CN) unit hydrograph approach. The existing/future land use and land cover data sets and climate change data sets (representing the changes in precipitation and temperature in 2030 and 2050) shall be used.
	Padang
	Image: Weight of the second
	0 200 400 600 800 1000 1200 Time (min)

Flood Hydraulics	The main objective of 1-dimension flood protection (Scenario 1) alor BWS DED (Scenario 2), and iii) flood protection services (Scenario context of existing hydrologic con- climate change (Scenario 4).	onal hydraulic models is to i) ide ng the river, ii) evaluate the propo- evaluate the level of enhancem ario 3). This evaluation was pe ditions (storm precipitation) and f	ntify existing level of osed concepts by the nent required for the rformed both in the uture conditions with
	using the DEMNAS DEM avai evaluated/validated through a c disaster data for historical flo BWS/BBWS, iii) Google Earth ti European Space Agency (ESA) s	lable by the BIG. The hydraul ombination of tools including i) ods, ii) historical flood maps me series images to explore flo atellite images of historical water	BNPB database for available with the bod impacts, and iv) extent.
Flood Risk Maps -	ESP Consultant shall develop flo	od risk maps through the exposi-	ure, vulnerability and
Processes	hazard processes and by using 1	-dimensional and 2-dimensional FRM Flowchart 1D Hydraulic Process and Output 2D Hydraulic D Hydraulic Process and Output 2D Hy	Process and Output Process and Output Underse Vialer Underse Vialer Underse Vialer Prod Hazard Prod Hazard
Flood Risk Maps - Outcomes	The outcomes shall be represent the river basin scale, as shown be	ted for i) agriculture areas and ii elow.) people/buildings at
	KISK to Agriculture Areas	KISK to People/Buildings	



Legend :	
	Capital Province
•	District Province
+ - +	Province Boundary
	District Boundary
	River Basin Boundary
	Watershed
	Shoreline
\sim	River
	Exisiting Reservoir
Sub Project	Information :
	BWS - Dikes / Flood Walls
	BWS - Normalisation
	BWS/EWSIP - Belawan Port
	BWS - Proposal

EWSIP - Proposal
EWSIP - Floodway
EWSIP - Salinity Dike

В В	Belawan Sub-basin
82	BWS SII Proposais
a	Delawan Kiver Improvements
0	Belawan Port
83	
a	Flood storage of Lengah River
b	Belawan detention basin 1
С	Belawan detention basin 2
d	S Badera detention basins & channel improve
е	S Krio detention basins & channel improve
f	Belawan River enhancements
g	Belawan Port enhancement
B4	EWSIP Future Proposal
а	Tembengan Barrage
P	Deli Percut Sub-basin
P2	BWS SII Pronosals
· · ∠	River normalisation for Deli River
a h	River normalisation for Babura River
0	Diver normalisation for Kora Diver
0	
~	Liperado floodway by low waita. Dali radial acti
a 	Opgrade noodway by low weirs, Den radial gate
D	Lau Simeme Dam operation plan
<u>c</u>	Namo Batang Dam 2 & Floodway
d	Percut detention & water restorative ponds
е	Siombak Lake extension
f	Sikambing storage basins
g	S Sikambing & S Putih transfers
h	SCADA upgrade to real time monitoring
i	Enlarge Belumai River
j	Deli River enhancements
k	Kera River enhancements
Ι	Babura River enhancements
D	Padang Sub-basin
17 22	RWS SII Proposals
<u>~</u>	Padang River flood walls
d h	Kalambah River flood walls
0	Floodway for S Pobliana
U d	C Debilong flood control structures
a	S Damiang flood control structures
e	INORMAIISE / ENIArge S Sigiling
РЗ	EWSIP Proposals
	Padang flood control basin
a	
a b	Bah Hilang small flood structure
a b c	Bah Hilang small flood structure Padang River Excavation
a b c P4	Bah Hilang small flood structure Padang River Excavation EWSIP Future Proposal
a c P 4 a	Bah Hilang small flood structure Padang River Excavation EWSIP Future Proposal NW Floodways

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