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The Role of RSAL Mintoharjo in Flood Management in Jakarta

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ABSTRACT

Rumah Sakit TNI Angkatan Laut (RSAL) Dr. Mintoharjo occupy a strategic yet vulnerable location in Bendungan Hilir, Central Jakarta, adjacent to the Krukut River. As a primary military medical facility, its operational resilience during Jakarta's seasonal flood events is paramount for maintaining emergency healthcare services and supporting Military Operations Other Than War (MOOTW/OMP). This study analyzes the dual role of RSAL Dr. Mintoharjo as both a flood-impacted facility and a key responder in regional disaster management. Utilizing a qualitative analytical approach combining field observations, document reviews of Hospital Emergency Preparedness Plans (HEPP), and semi-structured interviews with hospital management and local disaster agencies (BPBD DKI Jakarta), the research assesses structural adaptation, operational continuity, and civil-military coordination. The findings reveal that while structural defense mechanisms—such as amphibious flood barriers and elevated critical electrical systems—have successfully mitigated internal flooding risks since the severe 2013 and 2020 events, challenges persist in logistics transport through flooded access roads and inter-agency communication synchronization. The study proposes an integrated resilience framework to strengthen RSAL Mintoharjo's capacity as an amphibious medical response hub during major Jakarta inundations

INTRODUCTION

Flood Hazards and Critical Health Infrastructure in Jakarta

Jakarta, a mega-city situated on a low-lying coastal plain intersected by 13 rivers, faces compound flood risks driven by seasonal monsoons, tidal surges (rob), and land subsidence. Among the critical infrastructure most vulnerable to these inundations are healthcare facilities. The interruption of hospital services during a flood event degrades regional disaster response capacity precisely when medical demand spikes.

Rumah Sakit TNI Angkatan Laut (RSAL) Dr. Mintoharjo, located along the Krukut River basin in Bendungan Hilir, Central Jakarta, occupies a unique position in this landscape. Historically, the hospital has suffered severe inundations—most notably in 1996, 2002, 2013, and 2020—where floodwaters breached the compound, threatening critical medical gear, hyperbaric chambers, and patient safety.

Study Objectives

This research evaluates the operational and response frameworks of RSAL Dr. Mintoharjo during Jakarta flood disasters. Specifically, the study aims to:

a. Structural Defense: Evaluate the structural and non-structural adaptation measures implemented at RSAL Dr. Mintoharjo to protect critical medical infrastructure against recurring Krukut River overflows.
b. Continuity of Operations: Assess the Hospital Emergency Preparedness Plan (HEPP) regarding patient evacuation, power continuity, and specialized care delivery during active inundations.

c. Civil-Military Integration: Analyze the hospital's external deployment capacity under Military Operations Other Than War (MOOTW/OMP) in coordination with BPBD DKI Jakarta, Basarnas, and regional health authorities.

Hospital Safety and Operational Continuity

The World Health Organization (WHO) Hospital Safety Index (HSI) provides a framework for evaluating a medical facility's structural, non-structural, and functional capacity to remain operational during disasters.

$$\text{Hospital Safety Index } (HSI) = w_1(S) + w_2(NS) + w_3(F)$$

Where S denotes structural integrity, NS represents non-structural elements (critical utilities, medical equipment), F represents functional management (disaster plans, staffing), and w_1, w_2, w_3 represent relative weighting factors.

For high-risk urban hospitals, functional continuity relies on Operational Continuity Planning (OCP), ensuring that primary functions—such as intensive care, surgical suites, and emergency rooms—maintain uninterrupted power, clean water, and supply lines even when surrounding transport corridors are submerged.

Civil-Military Coordination in Disaster Relief

Under Law No. 3 /2025 is change from No. 34/2004 on the Indonesian National Armed Forces (TNI), disaster response falls under Military Operations Other Than War (MOOTW/OMP). Military health assets, such as RSAL Dr. Mintoharjo, play a pivotal role in augmenting civilian healthcare systems during severe crisis events through mobile field hospitals, amphibious transport, and specialized medical teams.

METHODS

Research Design

This study utilizes a qualitative descriptive analytical approach combined with an operational case-study design to examine RSAL Dr. Mintoharjo's flood resilience and disaster response execution.

Data Collection and Analysis

a. Spatial and Topographic Assessment: Analysis of site elevation data relative to the Krukut River flood level return periods (Q_{10}, Q_{25}, Q_{50}) using Geographic Information System (GIS) tools.
b. Document Review: Analysis of the hospital's internal Hospital Emergency Preparedness Plan (HEPP), flood SOPs, power generator contingency plans, and disaster response logs from 2020 to 2025.

Semi-Structured Interviews: Interviews conducted with key personnel across organizational boundaries:

1. RSAL Dr. Mintoharjo Command & Health Disaster Unit
2. Diskesal (TNI AL Health Service Directorate)
3. BPBD DKI Jakarta Emergency Operations Center
4. Basarnas Search and Rescue Coordinators

RESULTS AND DISCUSSION

Structural and Non-Structural Safety Assessment (Pillar 1)

Structural Modifications & Perimeter Barriers

Following major flood events, RSAL Dr. Mintoharjo implemented a multi-barrier defense system:

a. Hydraulic Flood Gates & Retention Ponds: Reinforced concrete flood walls equipped with automated hydraulic flood gates were constructed along the perimeter facing the Krukut River.
b. High-Capacity Drainage & Dewatering Pumps: Internal retention basins backed by multi-stage submersible dewatering pumps were integrated to evacuate residual rainwater seepage.

Theoretical Discussion

Critical Utility Elevation

In line with non-structural mitigation guidelines, critical non-structural elements were relocated above flood lines:

Utility / Asset	Historical Location (Pre-2013)	Current Location / Mitigation	Operational Impact
Main Power Switchgear	Ground Level / Basement	Elevated Platform (+3.5m NAL)	Prevents total power blackout during inundation.
Backup Generators	Ground Level	2nd Floor Dedicated Utility Bay	Ensures continuous power to ICU & operating rooms.
Hyperbaric Chamber Support Systems	Ground Level	Water-sealed containment / Elevated control panel	Protects specialized naval medical technology.
Medical Record Storage	Basement Level	Digitized / Cloud & 3rd Floor Storage	Eliminates risk of physical paper record loss.

Theoretical Discussion

The structural adaptations implemented at RSAL Dr. Mintoharjo demonstrate the application of the Defense-in-Depth principle in critical health infrastructure. By raising critical utility nodes above maximum inundation projections, the facility mitigates catastrophic service failure. However, absolute physical containment remains vulnerable to extreme multi-day rainfall events (>300 mm/day) combined with upstream river surges, which can overtop physical barriers if drainage pumps experience mechanical failure.

Hospital Operational Continuity and Emergency Protocols (Pillar 2)

Internal Emergency Response

The hospital's HEPP outlines specific operational triggers based on Krukut River water levels:

Alert Level 3: Standby

a. Krukut River rises above warning threshold
b. Internal dewatering pumps primed; EOC placed on standby

Alert Level 2: Activation

a. Water breaches outer perimeter road
b. Ground-floor patients transferred to upper wards via internal ramps/elevators

Alert Level 1: Full Emergency

a. Access roads submerged (>50 cm)
b. External power cut; backup generators engaged
c. Amphibious transport deployed for staff/patient movement

Logistics & Access Constraints

While internal facility operations remain protected, the primary operational bottleneck occurs at the external transport interface. Access roads connecting Bendungan Hilir to primary city arteries frequently submerge under 40–80 cm of water during major floods, impeding ambulances, logistics supply trucks, and shift-change medical personnel.

Theoretical Discussion

Evaluated through Operational Continuity Planning (OCP) frameworks, RSAL Mintoharjo exhibits high internal functional resilience but significant external vulnerability. When urban

infrastructure surrounding a hospital fails, the facility becomes an "operational island." Even if internal power and medical gas systems function, the inability of incoming patients and supplies to reach the facility diminishes overall community health capacity.

External Disaster Response and Civil-Military Integration (Pillar 3)

Mobile Response Deployment (MOOTW/OMP)

RSAL Dr. Mintoharjo functions as the primary operational base for the TNI AL Health Service disaster unit (Tim Satgas Kesehatan TNI AL). During major Jakarta flood events, the hospital deploys rapid-response teams equipped with:

RSAL Dr. Mintoharjo functions as the primary operational base for the TNI AL Health Service disaster unit (Tim Satgas Kesehatan TNI AL). During major Jakarta flood events, the hospital deploys rapid-response teams equipped with:

a. Rubber Boats (LCR) & Amphibious Trucks: Deployed into flooded residential zones in Bendungan Hilir, Tanah Abang, and Karet to perform field evacuations.
b. Mobile Field Clinics: Tents and mobile medical vehicles established at high-ground evacuation points to provide immediate treatment for hypothermia, waterborne diseases, and trauma.

Inter-Agency Coordination

External disaster operations are coordinated through joint emergency command channels:

BPBD DKI EOC / Basarnas] <==== (Radio/SATCOM) ====> [RSAL Mintoharjo EOC]

a. Field Medical Teams
b. Amphibious Evac Units

Theoretical Discussion

The deployment of RSAL Mintoharjo's specialized medical units illustrates effective civil-military integration in urban disaster management. However, field observations highlight challenges in communication interoperability. During severe flooding, commercial cellular networks experience congestion, and communication between civilian rescue teams (BPBD/Basarnas) and military health units occasionally relies on ad-hoc channels rather than fully integrated, automated tactical networks.

CONCLUSION

RSAL Dr. Mintoharjo has developed robust structural and operational mechanisms to protect its internal facilities against recurring flood hazards in Central Jakarta. The elevation of critical power utilities, implementation of hydraulic flood barriers, and internal dewatering systems enable the hospital to maintain functional continuity during major river overflows. Furthermore, as a military health facility, RSAL Mintoharjo provides critical external medical relief and amphibious rescue support to surrounding communities under MOOTW protocols.

However, external accessibility constraints caused by flooded access routes and gaps in inter-agency communication automation present ongoing challenges to fully optimizing its dual role as a high-capacity emergency hub.

Recommendations

a. Infrastructure & Access Upgrades: Construct a permanent elevated ambulance ramps connecting the emergency room (IGD) directly to main non-flooding transport arteries, bypassing low-lying Bendungan Hilir access roads.
b. Redundant Tactical Communication: Establish a dedicated, automated digital radio and satellite link connecting RSAL Mintoharjo's EOC directly with BPBD DKI Jakarta and Basarnas, bypassing civilian cellular infrastructure.
c. Joint Civil-Military Flood Drills: Conduct bi-annual integrated flood response simulations involving hospital personnel, local community leaders, BPBD, and Basarnas to streamline amphibious evacuation and field clinic deployment protocols.
d. Micro-Grid Energy Resilience: Integrate solar-PV and battery energy storage systems

(BESS) on hospital rooftops to provide additional redundant power backup for critical wards during prolonged municipal power outages.

REFERENCES

BMKG. (2020). Analisis Dini Curah Hujan Ekstrem dan Pemetaan Inundasi Banjir DKI Jakarta. Badan Meteorologi, Klimatologi, dan Geofisika.

BPBD DKI Jakarta. (2023). Rencana Kontinjensi Penanggulangan Bencana Banjir Provinsi DKI Jakarta. Badan Penanggulangan Bencana Daerah.

Chang, S. E., McDaniels, T. L., Fox, J., Dhariwal, R., & Longstaff, H. (2015). Toward disaster-resilient infrastructure: Systems analysis of possible earthquake impacts on ports and airports. IEEE Systems Journal, 9(4), 1475-1487.

Coppola, D. P. (2021). Introduction to International Disaster Management (4th ed.). Butterworth-Heinemann.

Diskesal. (2022). Petunjuk Pelaksanaan Layanan Kesehatan TNI AL dalam Penanggulangan Bencana Alam. Dinas Kesehatan Angkatan Laut.

FEMA. (2019). Design Guidance for High Risk Emergency and Healthcare Facilities. Federal Emergency Management Agency.

Mase, L. Z. (2020). Assessment of flood risk and mitigation strategies in Jakarta coastal urban environments. Journal of Settlement and Spatial Planning, 11(2), 101-112.

Perry, R. W., & Lindell, M. K. (2003). Understanding citizen response to disasters with implications for terrorism. Journal of Contingencies and Crisis Management, 11(2), 49-60.

Quarantelli, E. L. (1997). Ten criteria for evaluating the management of community disasters. Disasters, 21(1), 39-56.

TNI AL. (2021). Doktrin Operasi Militer Selain Perang (OMP) dalam Penanggulangan Bencana. Markas Besar Angkatan Laut.

UNDRR. (2015). Sendai Framework for Disaster Risk Reduction 2015-2030. United Nations Office for Disaster Risk Reduction.

WHO. (2015). Hospital Safety Index: Guide for Evaluators (2nd ed.). World Health Organization & Pan American Health Organization.