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Research Paper

Analysis of Emergency Construction Project Managementthrough Dredging the Atti River as Flood Management in TelukWondama Regency

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Abstract: *Flooding is a frequent disaster in TelukWondama Regency, necessitating an analysis of emergency construction project management through dredging the Atti River as a flood mitigation measure. One common structural effort undertaken in flood emergency response situations is river dredging. However, the implementation of emergency dredging is often reactive, unstructured, and not supported by a clear emergency construction management model, particularly in determining the priority of dredging areas. This study aims to analyze the application of emergency construction management in dredging activities on the Atti River in flood mitigation and to formulate a river basin-based emergency construction management model for river dredging.*
This study is using a descriptive, mixed-methods approach, combining quantitative analysis through questionnaires and qualitative analysis through open-ended comments and interviews. Quantitative data were obtained from 25 respondents from the Regional Disaster Management Agency (BPBD), the Public Works and Housing Agency (PUPR), implementing contractors, and affected communities.
The results of the study indicate that the implementation of emergency dredging of the Atti River was assessed as good and responsive, with an average value of 3.69 for the implementation dimension and 3.96 for the effectiveness dimension. The effectiveness of dredging was most felt in the middle and downstream areas of the river because it had a direct impact on restoring the river channel's capacity and reducing flooding. Based on the synthesis of the results of quantitative and qualitative analysis and the physical condition of the river, a River Basin-Based Emergency Dredging Construction Management Model was formulated as a reference for more targeted and effective dredging-based flood management.
Keywords:*Construction management, river dredging, flood, emergency, river basin/river segments..*

I. INTRODUCTION

TelukWondama Regency in West Papua Province is one of the areas with high vulnerability level to flooding disaster. From geography perspective, this area is coastal region with hilly topography where so many river streams serving as drainage channels for rainwater. High rainfall intensity, land morphology and pile up river sedimentation have caused several areas in TelukWondama experiencing repeated flooding in particular during rainy season.

One of many rivers that plays a strategic role in hydrological system and public services in study area is Atti River located in Isei Village of Raisei District. Raisei district is the capital city of TelukWondama Regency as the center of public services and government activities. According to the local government field data, stream of Atti River has length of approximately 3,090 meters with average width of 25 meters. From spatial perspective, Atti River channel divides the only main road that connects the government center in Raisei to several districts in the northen part of the regency. Therefore, any distrubance of the river's hydraulic function brings potential of not only causing flooding disaster but also delay or blocking inter-district connectivity, logistic distribution and public mobolity to the government center.

In recent years, Atti River has experienced significant increases of sedimentation materials as result of land erosion, surface runoff, and organic material from upstream areas. Silting at several critical poins has reduced the cross-sectional capacity of the river and triggering flooding into community land and surrounding areas during heavy rainfall. This situation urges the need for river dredging as an emergency measure to restore hydrological function and an act to reduce risk of flooding in the central government area and inter-regional transportation routes.

Figure 1. Lay out of Atti River in TelukWondama Regency

As fast response to flooding disaster, the Regional Disaster Management Agency (Badan Penaggulangan Bencana Daerah/BPBD) and PUPR Office of Teluk Wondama Regency carried out emergency river dredging several times to dealt with the problem. However, these dredging were generally reactive action as characterized by limited time, resources and inter-agency coordination. This situation is similar to the findings of Putra et al., who stated the flood control project requires appropriate or balanced management of cost, time and effectiveness to achieve the optimal result. Research by Shrestha et al., showed dredging and river channel improvement can reduce flood losses by more than 60 % when these activities were planned within an integrated manner with risk management. Meanwhile, Perwiranegara emphasized an appropriate or correct risk management strategy that implemented within flood control project can accelerate time duration for project completion and also reducing costs at the same time. In the context of Indonesia, the Flood Risk Management Module also emphasized the importance of rapid and integrated responses between structural and non-structural approaches in flood control program. [1,2,3,45]

So far, discussions related to Management Analysis of Emergency Construction Project by Dredging at Atti River in TelukWondama Regency as Flood Management have not been carried out by many researchers, therefore the writer proposed study problems in this study: (1) How effective the emergency dredging activity at the Atti River in reducing flooding risks on TelukWondama Regency?(2) What are the risks, obstacles, and critical factors that influence implementation of emergency dredging activity at Atti River, especially for maintaining the vital infrastructure functions of the Raisei region? (3) How to formulate an appropriate emergency construction management model for the implementation of river dredging in island regions such as TelukWondama Regency?

II. LITERATURE REVIEW

2.1. Project Management

According to PMBOK and Putra et al., a project management defines as application of knowledge, skills, tools and techniques to fulfill the project necessities. In the context of emergency project, this theory emphasizes on time flexibility, limited resource allocation and cross-agency coordination to ensure punctual completion of work in short time. [2,6]

2.2. Risk Management

According to Perwiranegara, risk management in construction project is a systematic process for identifying, analyzing, and responding to risks. Main risks in emergency project are include work delay, budget constraint, specification discrepancy, and inter-agency coordination. This theory is essential to be understood for reducing uncertainty to make the emergency dredging work can proceed in effective manner. [4]

2.3. Management of Flooding Risk

According to Center for Water Resources Development and Communication/Pusbangkom SDA and Shrestha et al., flood control is carried out using two approaches: (1) structural approach such as river dredging, embankment, channel normalization, and (2) non-structural approach such as early warning system and risk-based spatial planning. In this study, emergency river dredging is categorized into structural measure which must be supported by risk management. [3,5]

Flood risk management is conducted through a combination of structural and non-structural measures targeted at reducing potential losses and increasing the resilience power of the region to flood disaster. In determining amount of rainwater catchment discharge, the following formula can be applied to calculate its value [7]:

$Q = 0{,}278 \text{ x } C \text{ x } I \text{ x } A$ (1)

Description:

Q : Water discharge volume (m^3/second)
C : Discharge coefficient (no unit)
I : Water intensity (mm/hour)
A :Water catchment area (hectare)

2.4. Project Effectiveness

Project effectiveness is measured by objectives achievement in terms of cost, time and quality. In this study, effectiveness of river dredging was measured by reduced flood discharge, reduced inundation area, and efficiency in cost of time of work.

2.5. Management of Emergency Construction

An emergency construction management is an adaptation of project management principles for disaster conditions with nature of the construction work carried out is for responding the critical situation within a limited time. According to Pusbangkom SDA, its characteristics include: (1) speed of response, the activities must be carried out in immediate time to minimize the impact of the disaster, so the planning stage can be shortened or carried out in parallel with implementation, (2) planning flexibility, different from normal project with detailed planning from the start, emergency project must be adaptive and rely on quick decision-making according to the field condition, (3) efficiency in resources, due to limited time, many resources (tools, materials and labor) must be deployed in optimal although often with limited availability at the disaster site, (4) cross-agency coordination, the emergency activities must involving BPBD, DPUPR, local contractors, and the local community. Effectiveness of this coordination is very important for determining the success of field work, (5) the main goal is not only for completing the construction work, but more to restore vital function of the infrastructure in the shortest possible time so the community does not experience greater losses.[5]

Emergency construction management is an application of management functions under condition of limited time/time constraints and high-risk level so demanding of quick and adaptive decision-making. [8,9]

Primary stages in emergency construction management include: (1) rapid damage assessment, (2) emergency planning, (3) Rapid resource mobilization, (4) work execution using accelerated methods such as fast-tracking or crashing, and (5) evaluation of project implementation effectiveness.

This stage is necessary to ensure the emergency work can be carried out with optimal result. In emergency project implementation, safety and construction quality aspects still the top priority among others. PUPR Ministerial Regulation Number 10 of 2021 emphasizes for a construction safety management system must be implemented even during emergency work to minimize risk of workplace accidents. Lin et al., also added that emergency condition is often triggered by unexpected events such as natural disasters which categorized as force majeure. Therefore, project planning must anticipate these risks by developing mitigation and recovery strategies since the early stage. [10,11]

In the context of Teluk Wondama Regency, implementation of emergency construction management is evident in river dredging activities that executed for mitigating flooding caused by sedimentation. It requires rapid responses, use of local resources and inter-agency coordination quickly to restore the river function.

2.6. Function of Construction Management in Emergency Construction

The construction management function during emergency work keeps covering planning, organizing, implementing and controlling stages but with different implementation characteristics. Planning stage must be conducted in adaptive and gradual act according to evolving field condition. Organizing stage must emphasizes on clarity of roles between relevant agencies. While implementation stage is directed at the effectiveness of field actions, and the controlling stage focuses on time, work quality and safety risks.

This emergency construction management theory will be used as a basis for conducting analysis, in particular while assessing the implementation of dredging, cross-agency coordination, risk management, and effectiveness of flood management through dredging activity at Atti River.

2.7. Application of Emergency Construction Management to River Dredging Work

The application of emergency construction management to river dredging work is carried out by adapting the construction management principles to river work characteristics as well as the flood emergency condition. River dredging in emergency condition aims to restore the river channel capacity in quick action to reduce the inundation level and accelerating flood receding.

In the planning stage, river dredging is carried out based on identification to which part of river segment that has most critical risk to flood threat by considering time constraints, heavy equipment availability and field condition. Planning stage has selective characteristic in nature and does not cover the entire river channel in even treatments.

In the organizing stage, the implementation of emergency construction management emphasizes on cross-agency coordination between the Regional Disaster Management Agency (BPBD), Public Works and Housing Agency (PUPR), implementing contractors, and other relevant parties. The clarity or clear assignment of roles and chain of command are crucial factors for ensuring quick decision-making in the work field.

In the dredging stage, it focuses on selective dredging in river areas that experiencing the most significant impact on flood control such as middle and lower stream areas. The work method in this stage is adjusted to field condition and safety requirements.

In the control stage, it focuses on monitoring quality of dredging results, controlling implementation time, and mitigating technical and social risks that arise during the work activities. Control will be carried out continuously because this stage must be ready to adapt field action to the dynamic of river and weather conditions.

Thus, application of emergency construction management for river dredging work becomes the operational framework that will be used in the analysis, in particular during evaluating the implementation of dredging work at Atti River based on construction management perspective.

2.8. Calculation and Analysis Formula

The application of emergency construction management to river dredging work is carried out by adapting the construction management principles to river work characteristics as well as the flood emergency condition. River dredging

In this study, the theory is applied for Emergency River dredging due to sedimentation in TelukWondama Regency. In supporting the analysis, the following formula will be used:

1. Dredging productivity

$$P = \frac{V}{T} \qquad (2)$$

Description:
P : Dredging productivity (m^3/day)
V : Dredging volume (m^3)
T : Working time (day)

2. Risk analysis

$$R = P \times I \qquad (3)$$

Description:
R : Risk level
P : Probability of risk occurence
I : Risk impact

3. Dredging Effectiveness

Based on qualitative indicator (community survey)
Number of impacted houses:

$$E = \frac{R_b - R_a}{R_b} \times 100\% \qquad (4)$$

Description:
R_b : Impacted house before dredging
R_a : Impacted house after dredging

$$E = \frac{D_b - D_a}{D_b} \times 100\% \qquad (5)$$

Keterangan:
D_b : Inundation duration before dredging
D_a : Inundation duration after dredging

III. RESEARCH METHOD

3.1. Location of the Study

This study is using primary and secondary data, where the primary data includes of result from road condition survey to determine the type severity, and extent of road pavement damage as well as the existing traffic data in the form of Average Daily Traffic (ADR) and vehicle composition (motorcycle, light vehicles, buses, light trucks, and heavy trucks) which are used to describe condition of road service, capacity, and technical needs of the reconstruction.For the secondary data in this study, it was obtained from relevant agencies such as BPJN of East Nusa Tenggara, BPS, local police, and Bina Marga technical documents which include road geometric data, historical traffic data and traffic growth projections, construction cost data(AC-WC, AC – WC Asbuton, and HRS – WC), vehicle operating costs (BiayaOperasiKendaraan/BOK) and traffic accident data.

In addition, references to regulation and technical guidelines also included such as regulation Number 13 of 2024 from Minister of PUPR, and the road pavement guidelines from Directorate General of Bina Marga. [5]
This research was conducted in Wondama Bay Regency of West Papua Province. This is an area prone to flooding disaster due to river sedimentation.

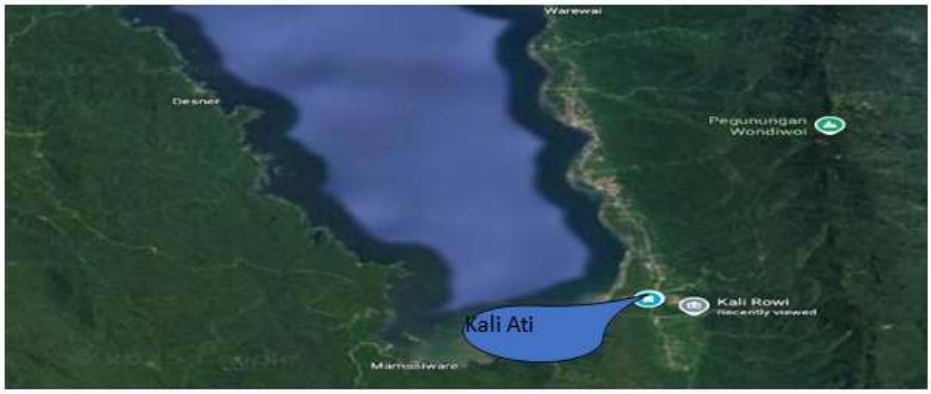

Figure 2. Map of research location

3.2. Population and Sample Study

Population in this study consisting of all stakeholders involved in the emergency river dredging activity as listed in the following explanation:

1. 10 respondents from BPBD officials of TelukWondama Regency
2. 5 respondents from PUPR Agency
3. 5 respondents from implementing contractors
4. 5 respondents from Community leaders and local community who experiencing impact of this condition

Sampling technique applied in this study was purposive sampling, selection of reliable respondents who have relevant information and experiences to the research topic.

3.3. Source of Type Data

Type of data used in this study are:

1. Primary Data: obtained through field observation, questionnaire, and interview to related parties.
2. Secondary Data: obtained through project report documents, rainfall data, visual documentation, and regulations related to emergency management and emergency construction.

3.4. Data Collection Technique

Data collection technique for this study are:

1. Direct observation to the dredging location
2. Questionnaire distribution to local community and field officers
3. Sub-structured interview with BPBD and PUPR officials, also technical implementer
4. Documentation study and literature review

3.5. Technique of Data Analysis

Data analysis technique was descriptive method using qualitative and quantitative approaches. The questionnairedata analyzed by descriptive statistics (mean, frequency, and percentage) while interview data analyzed thematically by grouping responses based on discussion topic. The analysis will be focused on answering research questions related to planning, implementation, challanges and effectiveness of emergency river dredging activity.

In addition, risk analysis also conducted by employing risk matrix based on respondent perception to the possibility and impact of the field challanges.

3.6. Stages of Quantitative Analysis

Questionnaire of the study was using Likert 5 points scale as ranging from the smallest value of 1 = Very Disagree to value of 5 = Strongly Agree. While data tabulation and data analysis for the questionnaire will be performed through these steps:

1. Dataediting and data verification

A checking procedure was carried out to verify questionnaire completeness and ensuring each answer was on a scale of 1 -5. Unfilled questionnaire items were recorded as missing values and were not forced to be filled in.

2. Data coding and data input

Each answer has a numeric code according to Likert Scale (1 – 5) where data then entered into Excel worksheet with format rows = respondents and columns = statement items, as well as respondent identity variables (groups/agencies).

3. Tabulation of frequency and percentage for each item

Distribution of response for each item was tabulated on a scale of 1 -5 in the form of frequency and percentage format. In addition, a top-box/bottom-box summary also created:

- Top-box = percentage of response value of 4 – 5 (Agree – Strongly Agree)
- Neutral = percentage of response value of 3
- Bottom-box = percentage of response value 1 -2 (Disagree – Strongly Disagree)

This summary is used to facilitate data intepretation on the stregth of respondents' support for each statement.

4. Calculationof mean and standard deviation (SD)

Mean and Standard Deviation (SD) values for each item are calculated and the mean value later will be used to determine tendency of the respondent perception while SD value will be used to determine level of responses variation.

5. Score arrangement per dimension

Questionnaire items where then put into groups of the following analysis dimensions:

- Implementation of Emergency Dredging (B) : B1 – B4
- Project Coordination and Management (C) : C1 – C4
- Risk Management (D) : D1 – D4
- River Dredging Effectiveness (E) : E1 – E4
- General Assesment (F) : F1 – F2

The dimension score is calculated using mean value of items within that dimension.

6. Rule of Data Completeness for Dimension score (missing value)

- For a dimension consisting of 4 items (B, C, D, E) the score of this dimension is calculated when the respondent answers at least 3 of the 4 statement items.
- For a dimension consisting of 2 items (F), the score of this dimension is calculated when the respondent answers 2 of the 2 statement items.

All analysis must report valid N to guarantee transparency.

7. Descriptive analysis on each respondents' group

Since respondents of this study comprised from several groups (BPBD, PUPR, contractors, and community), result study in descriptive format is also presented for each group, including:

- Mean and SD values for each dimension per group, also
- Summary table of dimension comparison scores between groups.

This analysis has a descriptive-comparative nature which is not intended for an inferential differences test.

3.7. Stages of Qualitative Analysis

Data of open-ended comments from respondents and also interview data were analyzed by a thematic approach. The analysis steps are as follow:

1. Reading all comments;
2. Put the comments into gropus and categorizes them into key themes (sediment/material management, SOP requirements, cross-stakeholder coordination, weather constraints, equipment/logistic readiness);
3. Presenting summary from the themes along with operational implications.

Next, the open-ended comments and or interview were used to clarify context of quantitative findings, in particular for those dimensions that showing lower mean scores or high response variation. This integration was conducted to generate more operational recommendations regarding strengthening implementation, coordination, field risk management and the effectiveness of emergency dredging.

IV. RESULT AND DISCUSSION

4.1. Dredging Effectivity at Atti River as Flood Management

The effectiveness dimension was performed by calculating the mean/average value from four statement items related to reducing floodwater level, accelerating water receding and perceived benefit for the community. Result calculation reached highest average/mean value (3.96) where the majority respondents stated the Atti River dredging work successfully reduce floodwater level, accelerate water receding and providing direct benefit to the community.

84 % respondents agreed or strongly agreed with item statements in this dimension. This finding indicate majority respondents experienced direct positive impact of Atti River Dredging activities, in particular for reducing floodwater level and accelerating water receding after heavy rainfall or high intensity rainfall disaster. The recapitulation questionnaire score on the dimension of Dredging effectiveness at Atti River in Flood Management dimension is listed in the following table (Table 1).

Table 1. Score from dimension of dredging effectiveness at Atti River as river management

Item	Statement	N valid	Mean	SD	Agree/Strongly Agree (%)	Neutral (%)	Disagree (%)
E1	Dredging work successful in reducing the height of flood water	25	4,08	1,04	88	4	8
E2	Dredging work accelerates water receding in the affected areas	25	3,76	1,30	80	8	12
E3	Community feels direct benefit from dredging work	25	4,00	1,06	80	12	8
E4	Dredging improves smoothness river flow	25	4,00	1,19	88	4	8
Effectiveness (E)		**25**	**3,96**	**1,15**	**84**	**12**	**4**

The results in table 1 support the flood risk management theory about river dredging as a structural measure that able to act quickly to restore river flow capacity, especially during emergency situation. In the context of Atti River, emergency dredging has proven able to restore river's hydraulic function with positive consequence of reducing flood risk in a short term. The highest score item was statement of river dredging successfully reduced floodwater level (with a mean score of 4.08 and agreement percentage of 88%). Moreover, a statement item that said community felt direct benefit from dredging is not only be felt technically through improved river flow, but also from social aspect through reduced disruption to community activities due to flooding. These perceived benefits also followed by benefit from reduced inundation frequency, reduced flood duration and higher sense of security for the potential subsequent flooding. [12]

From empirical perspective, dredging work at Atti River can be considered effective as an emergency flood management solution, in particular for reducing inundation and accelerating water receding, although this work does not replace the need for long-term solutions such as river normalization or controlling upstream sedimentation. In line with the research of Musta'in et al., river channel silting because of sedimentation can be handled through river maintenace activity in a form of dredging. River dredging aims to restore cross-sectional capacity of river channels to give way for water for flowing smoothly again and overflow risk during rainy season can be minimized. In high rainfall condition, silting rivers tend to overflow because it has reduced capacity then causing flooding in the surrounding area. [13]

4.2. Risks and Challenges of Emergency River Dredging Implementation

Value for risk and challanges dimension were analyzed through four statement items representing equipment and labor constraints, weather condition, occupational safety risks, and other operational constraints. Average score for this dimension is 3.40 as lowest score compare to other dimensions. This value indicates respondents of this study were aware of the significant risks and challanges in implementing emergecy dredging. As seen from relative low percentage of agreement reflects many different field experiences from the respondents regarding of obstacles of emergency dredging. This finding confirms that emergency construction project has high uncertainty level and requires more systematic risk management. The recapitulation questionnaire score on Risk and Challanges dimension of emergency river dredging implementation is listed in the following table (Table 2).

Table 2. Score fromdimension of risk and challange from emergency river dredging implementation

Item	Statement	N valid	Mean	SD	Agree/Strongly Agree (%)	Nautral (%)	Disagree (%)
D1	Obstacle/problems occur due to limited tools or manpower	24	3,17	1,13	54	12	33
D2	Weather becomes the main inhibitor in dredging implementation	25	3,28	1,31	56	12	32
D3	Work delays can be minimized through good coordination and evaluation	25	3,60	0,96	72	12	16
D4	Occupational safety risks have been anticipated with adequate supervision	25	3,52	1,08	72	8	20
Risk/Challanges (D)		**25**	**3,40**	**0,94**	**32**	**52**	**16**

Percentage of respondents who agree or strongly agree are only 32 % indicating a more diverse perception about implementation risk. Respondents identified several key risks such as limited heavy equipment and labor, effect from weather condition, and occupational safety risks. Since work environment is a place where work activities take place and brings direct impact to the health, safety and performance of the workers. Then poor work condition can reduce the condition of physical and mental health from the workers which ultimately took an impact to work performance and work productivity. Therefore, effort to control work environment is necessary act to prevent and mitigate potential health problems and occupational risk. In the context of occupational safety, accident in work environment can disrupt productivity and impacted on managing safe and healthy working condition as a crucial factor in supporting smooth implementation of the related construction work. [14]

Meanwhile, item with lowest score on this dimension was obstacle due to limited equipment or labor with a mean score of 3.17 and agremeent percentage of 54.17 %. Aside from it, weather condition as a limiting factor also received relative low socre (mean = 3.28). from a project risk management perspective, emergency construction project possess high level of uncertainty since this project will be carried out under force majeure condition. Uncertainty is one of main challanges in implementing construction activities, in particular for emergency construction project. Force majeure occasions such as natural disasters, flood, extreme weather condition, logistic disruption or limited access to area can occur in sudden time and bring direct impact to the continuity of project operations. Contingency planning becomes one important approach that can be implemented with function to anticipate and manage risks through structured, adaptive, and responsive steps to changing the field condition, so the emergency project implementation able to continue in effective way. Moreover, the result of this study confirms this theory where dredging work at Atti River was carried out under condition of limited time, unpredictable weather and limited resources in a remote area. [15]

This finding indicates that even the dredging work is feasible, risk mitigation aspects have not been fully systematically planned. Therefore, these risks keep having the potential to impact the effectiveness and safety of future emergency project implementation.

4.3. General Assessment and Need of Emergency Construction Management Model

The General Assesment dimension was analyzed based on two statement items reflecting the overall evaluation and the need of developing specific guidelines or SOPs. The mean score of this dimension is 3.86 and considered as high score indicating the overall implementation of emergency construction management considered effective and efficient. Percentage of respondents who agree or strongly aggree is 76 % with one important finding in high score of respondent agreement regarding the need of specific guideline or SOPs for emergency river dredging. Standard Operating Procedures (SOPs) is an important instrument for improving quality and consistency of decision-making process within construction project implementation, particularly in emergency situation. It serves as written guidelines that regulate work stages in technical and administrative workline to reduce potential of error, increasing implementation efficiency, and maintaining uniformity of action in the work field. In emergency construction project involving many agencies and stakeholders, SOPS serves as primary basis for operational decision-making starts from rapid planning stage and resource mobilization to work implementation and control. Therefore, understanding influential factors in SOP implementation is crucial for their effective function in supporting smoothness and successful implementation of

emergency construction projects. The recapitulation questionnaire score on general assessment dimension and the need of an emergency construction management model is listed in the following table (Table 3). [16]

Table 3. Score from dimension of general assesment and need of emergency construction management model

Item	Statement	N valid	Mean	SD	Agree/Strongly Agree (%)	Neutral (%)	Disagree (%)
F1	Overall, emergency dredging was assessed as effective and efficient	25	3,72	1,17	76	12	12
F2	Special guidelines/SOPs are needed for emergency dredging work in the future	25	3,96	1,06	88	4	8
Assesment (F)		**25**	**3,86**	**1,17**	**76**	**12**	**12**

Most prominent item in this dimension was statement regarding the need of specific guidelines or SOPS for future emergency dredging work with a mean score of 3.96 and an agreement percentage of 88 %. This finding indicates although dredging at Atti River was considered to be an effective move, respondents still believe there is a need for a more structured and documented management system. Result of this study indicates the success of Atti River dredging was influenced not only by technical aspects, but also from managerial aspects. The absence of standard emergency construction management model resulted in reactive dredging implementation that highly dependent on prior experiences from implementer in the field.

In implementation of construction project, work time delays often occur for so many factors such as weather condition, delay in material procurement, limited equipment and less than optimal availability and workperformance from the human resources. These condition have potentiality to disrupt planned achievement of project time target and reduce effectiveness of work implementation. Therefore, it requires an evaluation of the implementation from construction management especially in the aspect of controlling project implementation time and role of project managers in coordinating resources also controlling the implementation process to minimize delay. Therefore, result of this study emphasizes the need to formulate an adaptive, structured, and appropriate model for emergency river dredging construction management according to the characteristic of island region such as Teluk Wondama Regency.

Meanwhile, the model for emergency construction project management is displayed in the following figure (Figure 3). [17]

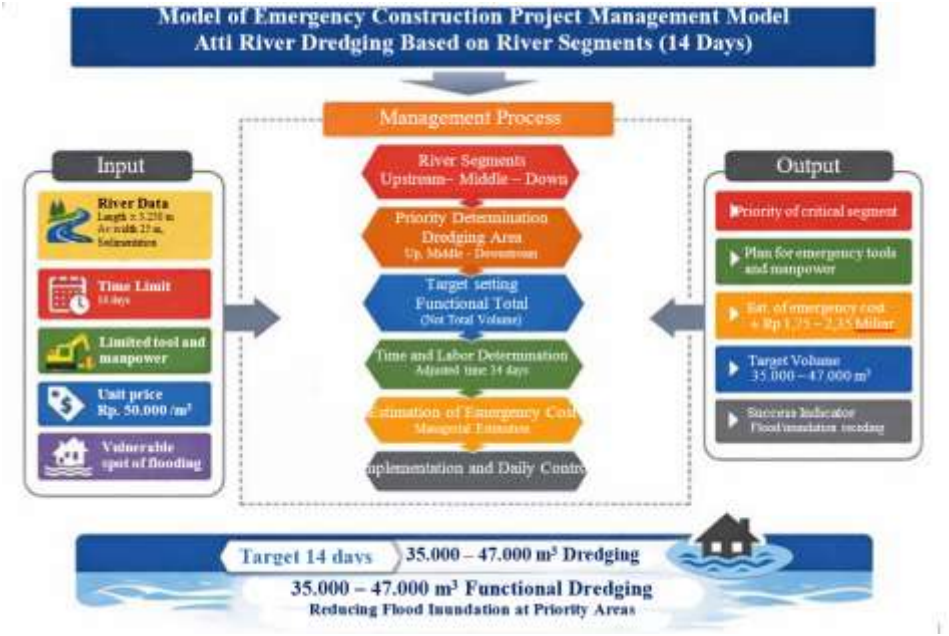

Figure 3. Model for River Dredging Emergency Construction Management Based on River Segments/River Basin (14 days)

V. CONCLUSION

According to result of data analysis and data synthesis sections, the following conclusions can be drawn from the research problems: (1) how effective is the emergency dredging at Atti River in reducing flood

risk in TelukWondama Regency, (2) What are the risks, constraints, and critical factors that able to influence the implementation of emergency dredging at Atti River, in particular for maintaining the vital infrastructure function of the Raisei region, (3) How to formulate an appropriate emergency construction management model for river dredging in island region such as TelukWondama Regency?

1. Effectiveness of emergency dredging at Atti River in reducing flood risk is represented with analysis result that showed the effectiveness dimension achieved the highest average score of 3.96 with 84 % respondents gave responses of agree and strongly agree at placed in the high category. In more specific explanation, indicators of dredging success are reflected in the reduction of floodwater level (mean score of 4.08), accelerated flood receding (mean score of 3.96), and direct benefits felt by community (mean score of 4.00). These values indicate the river dredging carried out within the framework of emergency construction management was effective in restoring river channel capacity and also effective for mitigating the impact of flooding particularly for the middle and lower area of Atti River.
2. Emergency dredging at Atti River faces different riks and constraints in each part of the river. The upstream area is dominated by erosion and landslide risks, and the middle area is struggling with limited equipment, weather condition and demands for efficient implementation time, and the downstream area faces higher social and safety risks due to its closeness range to resindetial and vital inftrastructure areas. Furthermore, cross-agency coordination has quite good acceptance with an average score of 3.61 but it remains situational and not yet integrated into a comprehensive river management system. This indicates the risks of emergency dredging are not only in technical aspect but also managerial and institutional aspects. These situations suggest without a clear emergency construction management framework, the effectiveness of dredging work has potential to decline in the next flooding disaster.
3. The research results indicate a strong need for an emergency river dredging construction management model that is structured based on river basin divisions (upstream–midstream–downstream). Based on the synthesis of the analysis results, this research has successfully formulated a River Basin-Based Emergency River Dredging Construction Management Model, which includes determining dredging priorities in the midstream and downstream areas, arranging implementation times within the 14-day emergency response limit, adaptive management of manpower and costs, and cross-agency coordination mechanisms as a unified management system.

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