

# Operational Planning of Sustainable Solid Waste Management: Experiences from Earthquake/Tsunami Impacted Districts of Aceh and Nias, Indonesia

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## ABSTRACT

*One of the infrastructure systems that were destroyed by the earthquake and tsunami disaster in December 2004 in Aceh Province and March 2005 in Nias Island, Indonesia, was the local government's solid waste management (SWM) system. UNDP-TRWMP and UN-HABITAT Indonesia have been providing assistances to the Local Government Units (LGUs) through TIM-SWM project to develop the capacity of local human resources for sustainable Solid Waste Management (SWM) by conducting trainings as well as developing Operational Waste Management Plans (OWMP) for each district.*

*The paper highlights the benefits and experiences of operational development plans in SWM for LGUs, the methodology adopted, the main activities, and the result of the process into an OWMP document which has become a practical approach in building the capacity of LGU officials. The capacity building exercises have been a cornerstone in building the know-how of the officials and staff involved. Thus the operational planning exercise and the resultant plan is expected to become a model in Indonesia at the local level for sustainable SWM and is expected to be replicated in other districts in Indonesia*

Keywords: Operational planning, solid waste management, capacity building.

## 1.0 BACKGROUND

Post earthquake and tsunami in December 2004 in Aceh and March 2005 in Nias, Indonesia, the Programme of Emergency Response and Transitional Recovery (ERTR) had been conducted by United Nations Development Programme (UNDP) which was derived into several programmes, among others the Tsunami Recovery Waste Management Programme (TRWMP) funded by the Multi Donor Fund (MDF) for Aceh Province and Nias Island, Indonesia, to rehabilitate solid waste management (SWM) infrastructure since March 2005. The initial efforts were to support the tsunami/earthquake debris clearance and promote livelihood projects, comply with Guidelines for Solid Waste Disaster Relief<sup>[1]</sup>. In the second phase, TRWMP provided assistances to restore essential SWM services in 13 districts<sup>1</sup>, while the third phase of TRWMP includes the construction of six priority

landfills and rehabilitation of other landfills, as well as continued support to strengthen the institutional capacity building in a so-called Training for Improved Municipal Solid Waste Management (TIM-SWM) Programme, January 2010 to June 2012 through the partnership with UN-HABITAT to promote the development of SWM system and strategy for its sustainability.



Source: BRR, 2009<sup>[14]</sup>

Fig-1. Tsunami debris in province capital of Aceh.

<sup>1</sup> Lhokseumawe, Aceh Utara, Bireuen, Pidie, Aceh Besar, Banda Aceh Municipality, Sabang, Aceh Jaya, Aceh Barat, Nagan Raya, Nias, Nias Selatan, and Simeulue.

Simultaneously as part of the TRWMP programme, the operational planning of Sustainable Solid Waste Management, which was later said to become Operational Waste Management Plans (OWMP)<sup>[9]</sup> for 8 (eight) districts/municipalities, has been formulated by an appointed consulting firm. TIM-SWM has been afterwards restructuring this guideline to be a basic, realistic, and image-based to allow rotated site staff to grasp the concepts quickly and easily as well as to generate worker pride in their roles and responsibilities. It was expected that each of eight districts would have initiated to develop each OWMP document as their basic guidelines for SWM operation.

## 2.0 OBJECTIVES

The assistance addressed to the Local Government Units (LGUs) in Operational Planning of Sustainable Solid Waste Management Plan has been delivered in the format of workshop series to develop OWMP document. The workshops support the implementation of TRWMP Phase III as well as TIM-SWM for building the capacity of LG Officials in terms of:

1. assisting LG Officials in drafting and preparation of OWMP document;
2. synchronizing the curricula given in TIM-SWM Trainings to be included into the document of daily planning and operation of SWM;
3. ensuring that the landfills being constructed by UNDP are equipped with operational planning;
4. assisting the LGUs to develop a systematic framework for managing sustainable SWM comprehensively;
5. accomplishment of OWMP documents in 8 (eight) districts/municipalities.

## 3.0 PROBLEM IDENTIFICATION

In line with the physical development of SWM facilities in the districts/municipalities, it was expected that the OWMP guidelines was followed up with further development of another manual book for directing the daily operation of SWM. However, it was not as expected that until the end of 2009, the LGUs did not follow up to finalize the OWMP documents as observed in each district that no OWMP document was ready and available to use as daily operational guidelines for solid waste management activities.

Therefore, UN-HABITAT proposed to conduct specific activities to develop 6 (six) OWMPs in 8 (eight) districts/municipalities associated with new construction of 3 regional landfills for Banda Aceh-

Aceh Besar, Lhokseumawe-Aceh Utara and Gunung Sitoli-Nias, as well as 3 district landfills for Sabang, Pidie, and Bireuen. The activities include a series of workshops in each district to oversee and assist the LGU Officials in the process of development of OWMP documents.

## 4.0 METHODOLOGY APPLIED

The approaches taken for this activity are listed below:

### 4.1 Activity conducted in Workshop Type

The activity has been implemented in a workshop type of activity which was chosen as it would be involving the LG officials more actively. TIM-SWM presented the “zero draft” to be discussed in each workshop.

### 4.2 Implemented in Workshop Series

In each district, workshops would be implemented in series consisting of three consecutive workshops along the duration of the project. The draft is discussed part by part from one workshop to the next one. It means, the whole draft is not discussed at once in the beginning, rather it is divided into several chosen topics in each workshop.

Applying such an approach, it indicated that the LGU had started writing the OWMP document. The advantages of the workshop through this method, among others are:

- TIM-SWM did not put too much burden on LG officials by limiting the topics in each workshop.
- Since only LGUs know exactly about SWM in their own service areas, the guideline being developed will be more practical.
- to make the LG officials involved.
- to monitor OWMP development.
- to increase ownership of OWMP.

### 4.3 Main draft prepared by TIM-SWM

Initially, TIM-SWM attempted to open opportunities for the LGU by making the initial draft of OWMP. Thus the LGU composes the contents of OWMP document from scratch, and afterwards, TIM-SWM reviewed it with feedback to to the LGU.

Apparently the results were less satisfactory, mainly because:

- LGUs did not seem to understand the concept of sustainable SWM properly,
- The discussion in each chapter did not really focus on the topic,
- LGUs only have limited references for initiating the zero draft.

The first two points have the impact on the difficulties experienced by TIM-SWM in reviewing the draft, while the latter affects the slow pace of work performed by LGUs.

Therefore, TIM-SWM then changed the methods and approaches, i.e. it compiled a "zero draft". Later LGU would complement the existing data and information about SWM in the relevant area that was only known by LGU; for instance, the number of transport vehicles, the number of villages served by the LGU, etc.

#### 4.4 The division of discussion topics in each workshop

In the first workshop, TIM-SWM presented only 4 chapters of draft to discuss. Not only that, the discussion within the LGU continued for 2 to 3 months until the second workshop, when LGU would make its presentation on the discussion results of those 4 chapters. After the presentation, a discussion session has been held. TIM-SWM presented other 4 chapters of draft to discuss for the third workshop.

#### 4.5 Internal Peer review and Review by Consultant

The OWMP document prepared as the "zero draft" has been originally reviewed internally by UN-HABITAT Governance Adviser and the TIM SWM Programme Manager. After incorporating the review comments, the zero draft of OWMP is to be discussed further with LGUs in the forthcoming and final workshops.

Having completed two workshops, where the expected 70% of the draft has been developed, the document has been reviewed by an international SWM from ARCADIS International, a Netherlands based SWM consulting company.

ARCADIS is not only theoretically reviewing the documents, but also will conduct site visits and investigate the aspects of technical operations in several districts, as well as discuss them in Banda Aceh and Jakarta with TIM-SWM and TRWMP.

#### 4.6 Finalizing in bilingual versions

Initial zero draft was prepared in English in order to be reviewed by UN-HABITAT's senior management. Then it was translated into Indonesian language to be discussed during the workshops.

Draft in English has been also reviewed by ARCADIS. The final results would be presented in two languages, that is Indonesian version for use by LGUs, and the English version would be submitted to TRWMP UNDP

as well as for UN-HABITAT documentation as part of knowledge management.

#### 4.7 Reference to national and international standards

Preparation of documents mainly refers to:

- Existing data and information from each district.
- National standards, including landfill standards by Indonesia's Public Works Department, etc.
- International Standards.
- Others, such as the Georgia State Solid Waste Plan<sup>[13]</sup>, etc.

### 5.0 CONTENTS OF OWMP

Basically, the document is divided into three parts, those are:

- I. Operational Management
  1. Scenario of Solid Waste Management in the District of "\_\_\_\_\_"
  2. Collection Management
  3. Disposal and Recovery facilities<sup>[2]</sup>
  4. Landfill Operations<sup>[10][12]</sup>
  5. Maintenance Plan
- II. Administrative Management
  6. Waste Management Regulations<sup>[7]</sup>
  7. Budgeting for SWM<sup>[6]</sup>
  8. Human Resource Management<sup>[3][4][5]</sup>
- III. Annexes: General Information and Guidelines
  9. Solid Waste Management
  10. Planning and Management of Integrated SWM
  11. Quality Control, Monitoring and Maintenance
  12. References and Background Reading Materials

### 6.0 ANALYSIS ON ACTIVITIES

#### 6.1 QUALITATIVE ANALYSIS

##### 6.1.1 Challenges

The following aspects are highlighted in relation with the challenges in conducting OWMP development:

6.1.1.2 Sustainability: Since the initial plan of intervention of solid waste management, TRWMP was fully aware that in addition to the reconstruction of SWM infrastructure in Aceh and Nias, the biggest challenge would be to ensure that the infrastructure developed are sustainable and optimally utilized. Therefore, TIM-SWM is expected to come up with the concept of capacity building that can address these challenges.

6.2.2 Strategy: The approach for the development of OWMP document also experienced some changes in

strategy since 2008. An engineering consultant that was appointed by TRWMP to develop guidelines that was supposed to direct all LGUs to compile the OWMP did not come up with any outcome. None of the 9 districts/municipalities was starting to compose the standard operating procedures by which the LGUs could run SWM day to day activities. When the TIM-SWM took over this task in early 2010, the first challenge was to setup an effective strategy to make LGUs "move" and make them as the main actors in the development of OWMP document.

**6.1.1.3 Time constraint:** Even after the workshop-type approach had been conducted, time constraints and LGUs' activities were among the biggest obstacles in encouraging them to stick with the timeline initially planned. For instance, Sabang Municipality, after being given 3 months to review and complete the four chapters after the first workshop, LGU still was not able to present the data and information at the second workshop, as expected.

It often happens that the workshop schedule needed to be shifted several times, or be adjusted following the availability of time of the LGUs. It is impacting the OWMP preparation progress.

**6.1.1.4 Understanding:** There is also a lack of understanding in looking at OWMP objectives thus LGU is showing the reluctance in preparing the document. When the Project Assistant TRWMP who assisted the LGU in the district asked as he monitored the progress of activities, they even questioned the use of OWMP. TIM-SWM gave emphasis and more in-depth understanding until one LGU finally is able to present well in the second workshop

**6.1.1.5 Legal aspect:** In term of legal aspect, Indonesia has just ratified the new regulation on SWM in 2008, namely National Act No. 18 year 2008<sup>[8]</sup>. In fact, Provinces of Aceh and North Sumatra do not yet have any bylaw on SWM. It has created a legal gap between the district and national levels. The impact is that the district/municipality is just starting to develop the regulation on SWM and retribution, which should be reflected in Chapter 7. TIM-SWM created two pilot projects to accelerate the preparation of legislation on SWM in two districts, starting from assessment, preparation of academic document, Focused Group Discussion involving associated stakeholders, until the final drafting of the SWM Bylaw.

**6.1.1.6 Budget:** Another challenge frequently pointed out by most LGU officials during the workshop is inadequate budget which has the

implication of improper operations. Limited service area coverage is one of these. Similarly, operational vehicles were minimal in terms of maintenance, not because LGUs do not want to perform vehicle maintenances, but limited budget makes the vehicle deterioration rapid due to lack of maintenance. When LGUs wrote Chapter 5 about Maintenance Plan, it became a real dilemma, as on the one hand, LGUs understood about the importance of maintenance plans and it has to be reflected in OWMP. But on the other hand, it has become a frustrating fact as the reality would not be the same as they write in the OWMP document.

**6.1.1.7 Physical development:** The aspect that is also important is associated with the construction of landfills. As mentioned above that out of 13 districts/municipalities that received assistances, TRWMP finally decided that only eight of them will receive assistances in term of physical rehabilitation or construction of new landfills. These are three regional landfills and three other district ones.



Source:TRWMP-UNDP, 2011

Fig-2. Proposed layout of Alue Alim Landfill, Lhokseumawe.

OWMP definitely should refer to those landfills that are going to be constructed since the operational plan is associated with the operation of landfills and collection routes/collection management. In fact, the construction of landfills, starting from the design process, the EIA, until the construction schedule suffered a delay due to technical and social reasons in the field. Chapters 2, 3 and 4 are closely associated with landfills, while the completion of OWMP could not be standing alone but should include the most up to date aspects out of the construction of landfills that are targeted for completion in June 2012. Up to the time of writing of this paper, the six landfills are yet to be constructed, so that there were still some parts of sub-section in the document OWMP that are still



blank and can only be completed after a design document and the landfill EIA is approved from all stakeholders. Two alternative solutions proposed by the TIM-SWM to resolve the OWMP document are:

1. OWMP development refers to the existing landfills with consequences that LGUs should revise it after the new landfills are completed.
2. OWMP negates the discussion/sub-chapters on landfill design and EIA, giving notes on the recommendations about the need to refer to these two aspects in the future.

### 6.1.2 Positive Responses

Regardless of all listed challenges mentioned above, the following aspects are highlighted in terms of positive responses of LGU:

6.1.2.1 Genuine: LGU generally shows sincerity in writing the document with remarkable outcomes. TIM-SWM decided to make one of the districts as a pilot project in the preparation of the OWMP because the district shows seriousness and significant earnestness, and hence can finish writing the appropriate documents as targeted.

6.1.2.2 Curiosity: Some LGUs have also been active in the discussions, asking a lot of questions that reflected seriousness, and querying a lot of inputs for operational improvements in their region. Young staffs were involved in the discussions and became leaders for the presentation.



Source: TIM-SWM, 2011

Fig-3. OWMP workshop in Sabang Municipality.

6.1.2.3 Willing to Learn: Another advantage is all involved districts/ municipalities are relatively new areas and under new development scenario after the tsunami. Hence the LGU is glad to learn new things that leads to new development. TIM-SWM also conducted a study tour to other provinces in Indonesia with success story in SWM sector, thus becoming an inspiration for the LGUs particularly in developing a sustainable OWMP.

6.1.2.4 Open for Improvement: The background of Aceh and Nias people happens to have a strong

culture and is rather closed. Aceh in history was the only region in Indonesia that was difficult to penetrate by colonialism, while Nias is an island that holds strong roots of culture until the present day. However, with a good approach, these two regions are able to adapt and open to receive inputs for the improvement of their respective regions. TIM-SWM does not come with the approach and concept to patronize the LGU. TIM-SWM invites LGU to discuss and try to ensure the good operation as well as to come out from the problems faced in the field of SWM. With this approach, LGU feels appreciated as their opinions are adopted. Experiences and information they already have were then packaged in such a way to be included as ingredients in preparing the zero draft of OWMP. The result is a combination of rich experiences with local knowledge but it does not reduce the essence of the technical operations that refer to national and international standards.

6.1.2.5 Persistence: In terms of geographical position, there are two islands that have specific challenges in the preparation of documents OWMP. Sabang and Nias Islands, in this case, have difficulties in developing plastic recycling activities, as it is difficult to market recycled plastic products of 3R activities. Similarly, the marketing of compost as fertilizer resulted in the landfill complex to face difficulties due to limited means of transport. However, such technical constraints did not diminish Sabang and Nias to formulate strategic moves to develop a sustainable SWM in order to comply with Standard National Indonesia (SNI) No. 19-14004-2005 about Environmental Management System<sup>[11]</sup>.

## 6.0 QUANTITATIVE ANALYSIS

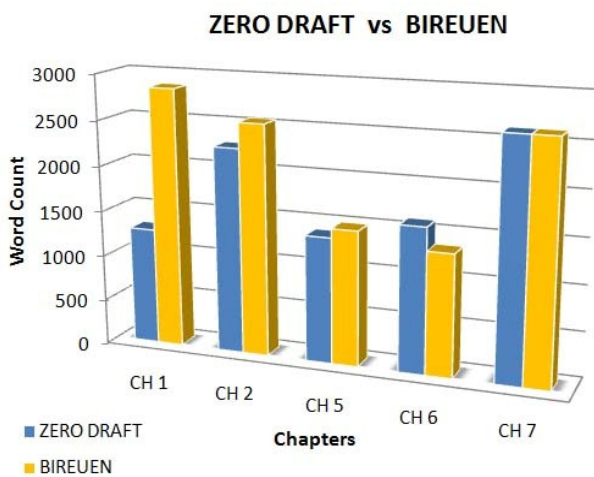
As already mentioned above that one objective of the activity is to encourage LGU to develop an SOP in sustainable SWM. It has begun with the TIM-SWM zero draft discussed in a series of workshops to get inputs and completed by all LGUs.

One indicator of LGU's active participation could be reflected from the changes that occur in the zero-draft prepared by TIM-SWM. At the first workshop, TIM-SWM presented Chapters 1, 2, 5, 6 and 7, and provided to all LGUs the softcopy. LGU is then expected to review the document, to complete it with sufficient data and information, or even to modify in accordance with the existing conditions in each district. For instance, the first workshop that was held in the District of Bireuen in middle of August 2011, TIM-SWM provided an opportunity for the LGU about two months to review those chapters until the second workshop in middle of October 2011.

Indicators of change for the evaluation is how far the LGU added data and information associated with the existing conditions in the region into the OWMP document. These changes should not always be the additional numbers of word in each chapter, but when LGU is confident to edit or remove a paragraph that would result in a reduced number of pages in a chapter, is also considered as an indicator of change.

Below is presented a graph that shows the dynamic process of OWMP development in the LGU. For a sample, the graph is displaying the preparation of documents in LGU of Bireuen District, Province of Aceh.

In the figure below, blue bars represent the numbers of words in each chapter out of zero-draft, while yellow bars are chapters developed by LGU of Bireuen District



Source: TIM-SWM, 2012

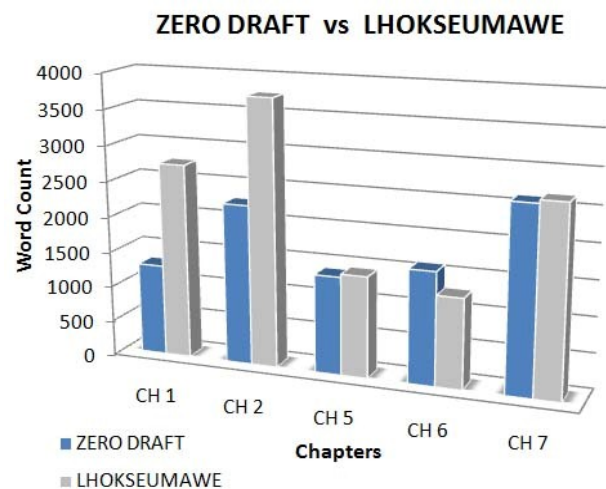
Fig-4. LGU of Bireuen District in developing OWMP

In Chapter 1 and Chapter 2, TIM-SWM encouraged LGU to elaborate existing conditions as clear as possible. Here, LGU has developed Chapter 1 more than double of the original chapter, while Chapters 5 talks more about maintenance aspects which LGU tend to see the content of this chapter as the rules that help them in performing maintenance of vehicles, heavy equipments, and infrastructure. Thus the LGU does not really change Chapter 5.

Similar cases occur for Chapters 6 and 7, which both discuss about by-law and the rules of finance respectively. In Chapter 6, the zero draft has already provided the document with all national and district regulations associated with solid waste management. The LGU will have to add those existing by-laws on solid waste management in the district. Or otherwise,

if the local regulation is not yet available, the LGU would have to describe the challenges and efforts towards the development of district regulations in solid waste management. While for Chapter 7, TIM-SWM has referred to Indonesian National Regulation on the budget and finance management., the LGU will just comply to the contents and apply it for solid waste management in the district.

Another example is the OWMP document developed by Lhokseumawe Municipality, as presented in Figure 5.



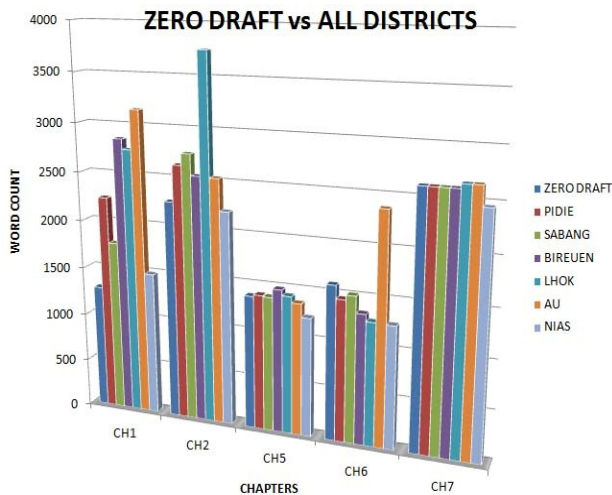
Source: TIM-SWM, 2012

Fig-5. LGU of Lhokseumawe District in developing OWMP

The LGU of Lhokseumawe has been shown a good work, reflected in Chapters 1 and 2. The contents are developed almost double of the original zero draft. Chapters 5, 6, and 7 show the same trend as previous graph.

With similar quantitative analysis, other districts can also be represented in graphs and shown as in the Figure 6.

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Source: TIM-SWM, 2012

Fig-6. Development process of OWMP document in several districts.

## 7.0 LESSONS LEARNED

The operational planning in sustainable solid waste management, or in this case OWMP development activities, has been implemented in 8 (eight) districts/municipalities in Aceh and Nias Provinces, and as many as 24 workshops in 4 series would have been implemented by the end of the project in June 2012. During the course of the various workshop sessions, some lessons that have been learned are briefly given below.

7.1 Improved solid waste management in associated districts and cites with better knowledge of SWM from the conducted workshops.



Source: TIM-SWM, 2012

Fig-7. Improved maintenance in LGU of Banda Aceh: truck washing before go out of landfill.

7.2 The series of workshop indicated increased understanding of the planning and operational

issues that need fresher strategies for anticipating the lack of several parameters, i.e. political will, budget, and technical capacity to improve the operations of SWM in the district/municipality.

- 7.3 The LGUs became aware of the need to have a specific section associated with customer relations and revenue collection, as they became more aware of good and effective community involvement in solid waste management.
- 7.4 In term of legal aspect, all the districts and municipalities are currently moving forward to develop local regulations on SWM and propose new retribution tariffs.
- 7.5 The regional landfill will have to serve solid waste disposal from two units (Banda Aceh and Aceh Besar, or Lhokseumawe and Aceh Utara, or Gunung Sitoli and Nias). The inter LGU cooperation and private sector participation is strategic to solve the problem of limited resources (budget, equipment, technology and human resources) as well as bring about mutual cooperation.

## 8.0 CONCLUDING REMARKS

The paper has highlighted the activities of TIM-SWM in for developing operational plans for sustainable solid waste management in post earthquake and tsunami districts/municipalities of Aceh Province and Nias Island. Upon completion of more than 24 months of implementation, the Operational Waste Management Plan (OWMP) activities have the following conclusions and recommendations are based on ground experiences.

### 8.1 CONCLUSIONS

Based on the completed workshops and progress of OWMPs, the conclusion that can be drawn from the implementation of the OWMP activities in the context of TIM-SWM project:

- A post-disaster intervention programme with the project in the form of physical development, such as infrastructure development and reconstruction, needs to be balanced with the capacity-building of local human resources development, especially operational planning. In the context of Aceh and Nias, particularly the development of sustainable solid waste management, the OWMP process shows that after giving physical assistance, the LGU still requires support in term of non-physical and “software” assistances to ensure that the infrastructure constructed can be operated and maintained properly in a sustainable manner.



## 8.2 RECOMMENDATIONS

Several recommendations are listed below as a result of the experiences from OWMP activities:

- In carrying out the capacity building for operational planning, OWMP in workshop series can be used as a model for similar activities for other UN-HABITAT activities in future.
- It is critical to keep the balance of stakeholder involvement. The formulation of basic concepts cannot be given entirely to stakeholder. Therefore, it is advisable to prepare a "zero draft" in the initial step, and then "test" it through internal reviews, peer review by external experts, and through ongoing workshops with stakeholders.
- The process of preparation of technical planning and operations should consider the existing conditions and field activities. Theoretical approach is indeed important, however adjustments to the field aspects will be the critical success factors for a sustainable planning process.
- OWMP planning process is deemed necessary in many districts in Indonesia, as well as in the developing world, as it will contribute to the MDGs target. The implementation of the OWMP approaches could be used as lessons learned and adopting the factors that are likely to be duplicated and implemented in other similar UN-HABITAT projects in other parts of Indonesia and in the world.

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