Problems in Materials and Equipment Procurement of Indonesian Contractors

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AFFILIATION

- Indonesia Construction Experts Association
  - One of the biggest construction expert associations in Indonesia
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  - Accredited by National Construction Council
  - Active in construction certification, trainings, and research
- Indonesia Institute of Technology
  - Accredited by National Accreditation Board
  - Thousands of students from all Indonesia and neighbor countries
  - Active in research and industry improvement networking

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- Background
- Literature Review
- Methodology
- Findings and Discussion
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BACKGROUND

- Often the construction project is hampered due to problems of unavailability of construction materials and equipment (Clough et. al., 2005)
- Annual increase in the Indonesian central government budget for infrastructure development in Public Work Ministry from 16 trillion rupiah in 2009 to 60 trillion rupiah in 2014

→ the readiness of supporting sectors that supply materials and construction equipment sectors is required both in quantity and distribution pattern

OBJECTIVES

- → to map the problems of construction materials and equipment procurement in Indonesia so that construction activities can be held more effectively

LITERATURE REVIEW: MATERIALS

- Construction materials can be divided into two categories:
  - Direct material (cement, sand, gravel, steel, wood, brick, paint, ceramic, natural stone, and other building materials),
  - Indirect material (air conditioning, fan, light fixture and electrical, furniture, generators, etc.).
- Domestic material and non-domestic material:
  - Domestic material is material that is made in Indonesia, both the original trademark Indonesia (e.g. Semen Cibinong, KIA etc.), and which is under-licensed or franchise of foreign brands (e.g. Holcim Cement, AC Sharp, heavy equipment Catterpillar etc.).
  - Non-domestic material is made outside of Indonesia (e.g. China, USA, etc.), and thus requiring the import process in its delivery. Materials such as steel, metals, and zinc are imported, on the other hand aluminum, copper, and woods are exported in Indonesia.
  - Strong indication there are problems of some construction materials, mainly portland cement and steel for unknown causes (under production or trading issues), so that such materials are imported from Malaysia and China.
  - → Utilization of construction materials and equipment database is very important for construction project success in Indonesia (Mochtar, 2011).

LITERATURE REVIEW: EQUIPMENT

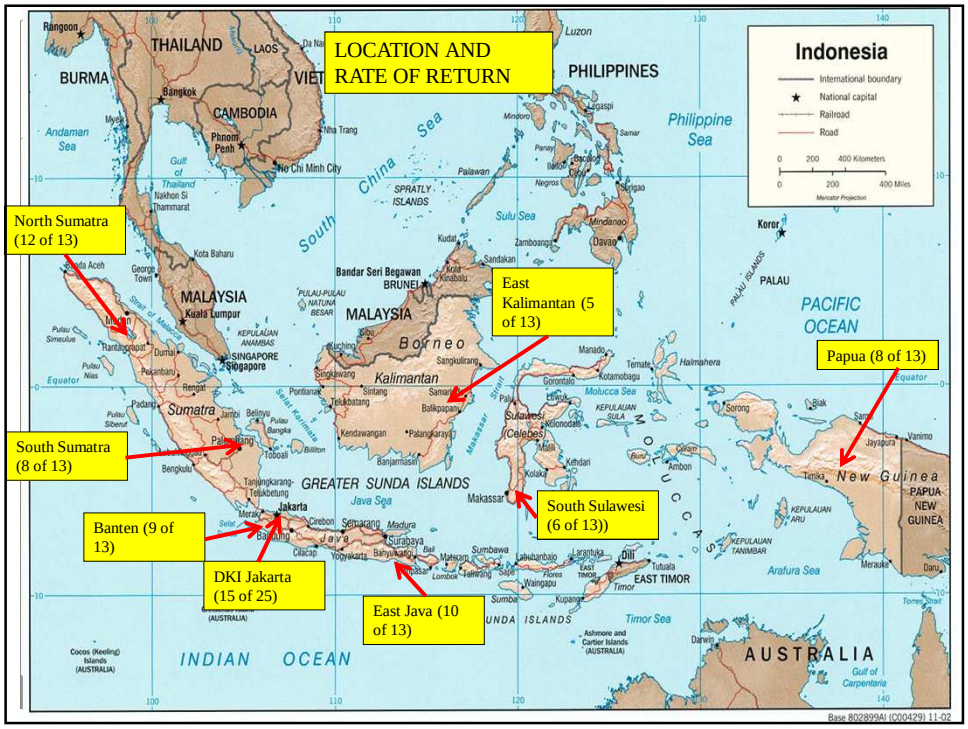
- Indonesian Construction Services Development Board construction equipment categories:
  - destruction tools (demolition),
  - the stripping of land preparation (e.g., dozer, scraper, etc.), erection, and
  - foundation (e.g. drilling equipment, cranes, etc.).
- Business of construction equipment rental and sales was established since the 1980's spread throughout Indonesia (LPJKN, 2010).
  - stand-alone rental business,
  - part of the main contractor equipment division, which also rents tools and equipment

LITERATURE REVIEW: DATABASES

- In Indonesia construction projects continue to grow both volume and complexity at various levels
- Not followed by an increase in optimizing the use of information technology including the construction materials and equipment database.
- → many projects are delayed because the contractors do not have enough data about the materials and equipment availability necessary for completion of the project, so that they face problems in procuring materials and equipment in their projects resulting the performance of cost and time of projects in Indonesia is not optimal (Mochtar, 2011)

METHODOLOGY

- Data collected from Indonesian general contractors in category of large contractor member of GAPENSI, the biggest and oldest association of contractors in Indonesia



METHODOLOGY

- The data is collected using a multiple choice questionnaire.
- The questionnaire, consisted of 14 questions, explores:
  - the existence of problem of the contractor to procure the materials and equipment,
  - their perception of its solution by developing and utilizing materials and equipment database,
  - and finally important features of the database;
- In this paper responses from two questions that explore the existence of problem of the contractor to procure the materials and equipment is presented.
- The data collected is then analyzed using simple statistic analysis, namely frequency analysis. By using this analysis, the percentage of all respondents to any question in the questionnaire is found, and then interpreted.

RESEARCH FINDINGS

MATERIALS

Table 1. Average Percentage of Respondents that Perceive Difficulty in Materials Procurement and its Causes

No	Materials	Total	P1	P2	P3	P4	P5	P6
1	**Portland Cement**	**28%**	0%	**8%**	**20%**	**9%**	2%	**11%**
2	**Asphalt**	**38%**	0%	**6%**	**25%**	**7%**	2%	**12%**
3	Ready Mix Concrete	20%	0%	8%	2%	1%	4%	11%
4	Formed Steel	23%	0%	1%	14%	3%	2%	11%
5	Reinfocement Steel	21%	0%	2%	13%	4%	2%	9%
6	**Precast**	**31%**	0%	**10%**	**11%**	4%	**10%**	**9%**
7	Concrete Aggregate	18%	0%	2%	3%	2%	1%	14%
8	Mechanical Electrical	11%	3%	1%	2%	2%	1%	8%
9	Architectural	12%	2%	2%	4%	1%	1%	8%
10	Others	0%	0%	0%	0%	0%	0%	0%
	Average		**0%**	**4%**	**9%**	**3%**	**3%**	**9%**

P1: Domestic product is not available (need import) (P1)

P2: Domestic product is not sufficient (P2)

P3: No timely distribution (P3)

P4: High price (P4)

P5:Problems of availability of comprehensive producer/distributor information (P5)

P6: Others (P6)

MATERIALS

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9	Architectural	12%	2%	2%	4%	1%	1%	8%
10	Others	0%	0%	0%	0%	0%	0%	0%
	Average		**0%**	**4%**	**9%**	**3%**	**3%**	**9%**

The most common causes are others (transport/infrastructure, especially in Papua), 9%; and the distribution is not timely (P3), 9%. Meanwhile, the difficulty of information (P5) is perceived by very few (3%) respondents (as precast is the highest, 10% of respondents), while in fact it occupies the cause of the difficulties often faced by the respondents. This may confirm the need for a program of materials database development and its socialization forward the importance of the database in solving this difficulty.

ASPHALT

LOCATIONS AND CAUSES:

- Particularly by respondents in provinces of Papua, Jakarta, and North Sumatera (respectively 75%, 47%, and 42% of respondents).
- For Papua (the remote and the less developed area in eastern Indonesia) it is caused by the distribution problems for remoteness of the province for no asphalt producer in Papua, and thus it must be transported from outside Papua province.
- On the other hand, for Jakarta (the capital city of Indonesia, the most developed province in Indonesia) and North Sumatera (relatively developed province in western Indonesia), it is caused by the large demand quantity of asphalt materials in peak demand period of time making the contractors have to compete to procure the asphalt.
- This is confirmed by finding that the most common causes (respectively 25%, 12%, 7% and 6% of respondents) were improper distribution time (P3), others (transportation/infrastructure, especially in Papua) (P6), the high price (P4), and domestic production is not sufficient (P2) (Table 1).

DATABASE POTENTIALS

- While the difficulty of information (P5) is felt by only 2% of respondents (the largest Papua, which is 13%), while in fact they still have most problems with asphalt procurement.
- This may mean that the awareness of the role of databases in helping them is still very small. This explains the need for a program such as materials database development and its socialization forward the importance of the database in solving this difficulty.

PRECAST

LOCATIONS AND CAUSES:

- Particularly by respondents in Jakarta and Papua (respectively 80% and 63%).
- For Jakarta, it is caused by large demand quantity of the materials in peak demand period of time, even though there are many precasters arround Jakarta, the contractors have to compete to procure pracast materials in Jakarta.
- On the other hand, for Papua it may be caused by the fact that very few precasters exist in Papua. As a result, like in Jakarta, the contractors have to compete to procure precast materials in Papua.
- This is confirmed by finding that the most common causes (respectively 11%, 10%, 10% and 9%) were improper distribution time (P3), domestic production is not sufficient (P2), the difficulty of information (P5), and others (transportation / infrastructure, especially in Papua) (P6) (Table 1).

DATABASE POTENTIALS

- The difficulty of information (P5) is felt by 10% of respondents (the largest Papua, which is 27%). Similar with asphalt and PC materials, this may explain the need for a program such as materials database development and its socialization forward the importance of the database in solving the difficulty on precast procurement in Indonesia.

PORTLAND CEMENT (PC)

LOCATIONS AND CAUSES:

- Particularly by respondents in Papua, South Sumatra, and Jakarta (respectively 100%, 50%, and 40% of respondents).
- For Papua, it is caused by the distribution problems for remoteness of the province for no PC factories in Papua and thus it must be transported from outside Papua province.
- On the other hand, for Jakarta and South Sumatera (relatively developed province in western Indonesia), it may be caused by large demand quantity of the materials in peak demand period of time making the contractors have to compete to procure the PC.
- This is confirmed by finding that the most common causes (respectively 20%, 11%, 9% and 8% of respondents) were improper distribution time (P3), others (transportation / infrastructure, especially in Papua) (P6), the high price (P4), and domestic production is not sufficient (P2) (Table 1).

DATABASE POTENTIALS

- While the difficulty of information (P5) is felt by only 2% of respondents (the largest Papua, which is 13%) while in fact they still have second most problems with PC procurement.
- This may mean that the awareness of the role of databases in helping them is still very small. Similar with asphalt, this may explain the need for a program such as materials database development and its socialization forward the importance of the database in solving this difficulty.

EQUIPMENT

Table 2. Average Percentage of Respondents that Perceive Difficulty in Equipment Procurement and its Causes

No	Equipment	Total	P1	P2	P3	P4	P5	P6	P7
1	Dozer	16%	3%	1%	4%	6%	3%	1%	8%
2	Excavator	13%	2%	1%	2%	1%	1%	1%	9%
3	**Grader**	**22%**	2%	1%	2%	**12%**	3%	3%	**8%**
4	Backhoe	13%	2%	0%	1%	3%	1%	2%	8%
5	Loader	12%	2%	0%	2%	2%	1%	1%	8%
6	**Tower Crane**	**30%**	10%	1%	**7%**	**16%**	3%	1%	**8%**
7	Mobile Crane	20%	3%	0%	4%	9%	1%	2%	8%
8	**Dump Truck**	**29%**	5%	2%	4%	**14%**	1%	8%	**8%**
9	Rolling Compactor	11%	1%	1%	0%	1%	1%	1%	8%
10	Others	3%	1%	1%	3%	2%	1%	3%	0%
Average			3%	1%	3%	7%	1%	2%	7%

P1: Domestic product is not available (need import) (P1)
P2: Domestic product is not sufficient (P2)
P3: No timely distribution (P3)
P4: Rental is not sufficient (location and number of equipment) (P4)
P5: High price (P5)
P6: Problems of availability of comprehensive producer/distributor/rental information (P6)
P7: Others (P7)

EQUIPMENT

Table 2. Average Percentage of Respondents that Perceive Difficulty in Equipment Procurement and its Causes

No	Equipment	Total	P1	P2	P3	P4	P5	P6	P7
1	Dozer	16%	3%	1%	4%	6%	3%	1%	8%
2	Excavator	13%	2%	1%	2%	1%	1%	1%	9%
3	**Grader**	**22%**	2%	1%	2%	**12%**	3%	3%	**8%**
4	Backhoe	13%	2%	0%	1%	3%	1%	2%	8%
5	Loader	12%	2%	0%	2%	2%	1%	1%	8%
6	**Tower Crane**	**30%**	10%	1%	**7%**	**16%**	3%	1%	**8%**
7	Mobile Crane	20%	3%	0%	4%	9%	1%	2%	8%
8	**Dump Truck**	**29%**	5%	2%	4%	**14%**	1%	8%	**8%**
9	Rolling Compactor	11%	1%	1%	0%	1%	1%	1%	8%
10	Others	3%	1%	1%	3%	2%	1%	3%	0%
Average			**3%**	**1%**	**3%**	**7%**	**1%**	**2%**	**7%**

The most common causes are others (transport / infrastructure, especially in Papua), 7%; and not sufficient rentals (P4), also 7%. Meanwhile, the difficulty of information (P6) is perceived by very few (2%) respondents, while in fact it occupies the cause of the difficulties often faced by the respondents. This may confirm the need for a program of equipment database development and its socialization forward the importance of the database in solving this difficulty.

TOWER CRANE

LOCATIONS AND CAUSES:

- particularly by respondents in Jakarta and Papua (respectively 80%, and 63% of respondents).
- For Jakarta, it may be caused by large demand quantity of tower crane in peak demand period of time making the contractors have to compete to procure the tower crane in Jakarta.
- On the other hand, for Papua, it may be caused by the distribution problems for remoteness of the province for no tower crane producer and few tower crane rentals in Papua.
- From Table 2, it is confirmed that the most common causes (respectively 16%, 8%, and 7% of respondents) were rental is not sufficient (location and number of equipment) (P4), others (transportation / infrastructure, especially in Papua) (P7), and improper distribution time (P3).

DATABASE POTENTIALS

- The difficulty of information (P5) is felt by only 1% of respondents (the largest in Jakarta, which is 7%), while in fact they still have most problems with tower crane procurement.
- This may mean that the awareness of the role of databases in helping them is still very small, and thus this may explain the need for a program such as equipment database development and its socialization forward the importance of the database in solving this difficulty.

DUMP TRUCK

LOCATIONS AND CAUSES:

- Procurement of dump truck is perceived the number two the most difficult by responding contractors, by respondents in Papua (63% of respondents); other provinces do not perceive it difficult.
- In Papua, the remote and least developed area in eastern Indonesia, it may be caused by the distribution problems for remoteness of the province for no dump truck producer or few dump truck rentals in Papua. From Table 2, it is confirmed that the most common causes (respectively 14% and 8% of respondents) were rental is not sufficient (location and number of equipment) (P4), and others (transportation / infrastructure, especially in Papua) (P7).

DATABASE POTENTIALS

- The difficulty of information (P5) is felt by 10% of respondents (the largest Papua, which is 27%). Similar with asphalt and PC materials, this may explain the need for a program such as equipment database development and its socialization forward the importance of the database in solving the difficulty on dump truck procurement in Indonesia.

GRADER

LOCATIONS AND CAUSES:

- particularly by respondents in Papua (63% of respondents); other provinces do not perceive it difficult.
- In Papua, it may be caused by the distribution problems for remoteness of the province for no grader producer or few grader rentals in Papua. From Table 2, it is confirmed that the most common causes (respectively 12% and 8% of respondents) were rental is not sufficient (location and number of equipment) (P4), and others (transportation/infrastructure, especially in Papua) (P7).

DATABASE POTENTIALS

- The difficulty of information (P5) is felt by only 3% of respondents (the largest in Jakarta, which is 13%), while in fact they still have the third most problems with grader procurement.
- This may mean that the awareness of the role of databases in helping them is still very small, and thus this may explain the need for a program such as equipment database development and its socialization forward the importance of the database in solving this difficulty.

POLICY IMPLICATIONS

- Based on those findings, it is highly recommended to
  - Develop distribution infrastructures in east part of Indonesia
  - Increase production capacity/supply in west part of Indonesia
  - Develop construction materials and equipment database through a program of technical aid and socialization of benefits of the database to Indonesian contractors.
    - The technical aid may be the hardware, software, and also the skill enhancement of database operators;
    - The socialization program may be seminars, workshops, and training on construction materials and equipment database matters to all stakeholders, so that they should finally develop, subscribe, and access the database for construction purposes to overcome their problems in materials and equipment procurement.

CONCLUSION

- Materials
  - That are relatively difficult to procure are asphalt (38%), precast (31%), portland cement (28%), which often occupies three biggest problems faced in procurement.
  - The most common causes are others (transport/infrastructure, especially in Papua), 9%; and the distribution is not timely (P3), 9%.
  - Meanwhile, the difficulty of information (P6) - 3% (as precast is the highest, 10%), also occupies the cause of the difficulties often faced by the respondents, even though relatively low compared to other causes.
  - In terms of spatial, Papua (the least developed province in Indonesia) has many constraints in transportation of materials, while Jakarta (capital city of Indonesia, the most developed province in Indonesia) that has a lot of big projects often experiences a shortage of supply of materials, especially for materials with large number and with special specifications.
  - Awareness of the role of databases in helping them is still very small. All these may explain the need for a program such as socialization of the importance of construction materials database in solving this difficulty.

CONCLUSION

- Equipment
  - That are relatively difficult in procurement, are tower crane (30%), dump truck (29%), and grader (22%), which often occupies three biggest problems faced in procurement.
  - The most common causes are others (transport / infrastructure, especially in Papua), 7%; and not sufficient rentals (P4), also 7%.
  - The difficulty of information (P6) - 2%, also occupies the cause of the difficulties often faced by the respondents, even though relatively low compared to other causes.
  - Similar with materials, in terms of spatial, Papua has many constraints in transportation of equipment, while Jakarta that has a lot of big projects often experiences a shortage of supply of equipment, especially the larger capacity equipment.
  - Awareness of the role of databases in helping them is still very small. All these may explain the need for a program such as socialization of the importance of construction equipment database in solving this difficulty.

CONCLUSION

- Policies on development of
  - Distribution infrastuctures in east part of Indonesia especialy in Papua
  - Production capacity/supply in west part of Indonesia, especially in Jakarta, North Sumatra
  - construction materials and equipment database should be developed to overcome Indonesian contractors problems in materials and equipment procurement.

THANK YOU
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