

# Problems in Materials and Equipment Procurement of Indonesian Contractors

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**Keywords:** Availability, Database

## SUMMARY

Materials and construction equipment is one of the inputs for the construction process. Often the construction project is hampered due to unavailability issues of materials and construction equipment. The purpose of this study was to map the problems of construction materials and equipment procurement in Indonesia, so that construction activities can be held more effectively. The study was by conducting surveys in the central areas of construction in Indonesia provinces, including DKI Jakarta, North Sumatra, South Sumatra, Banten, East Java, East Kalimantan, South Sulawesi and Papua. In this study the primary data is collected from Indonesian contractors to confirm the existence of the problem of the contractor to procure the materials and construction equipment and their perception on materials and equipment database utilization for its solution. It can be concluded that indeed there are some construction materials and equipment that are often difficult to be procured in their projects that is urgently looked for the solution in the future to overcome these problems, especially by developing and utilizing database of construction materials and equipment in Indonesia.

## RINGKASAN

Material dan peralatan konstruksi merupakan salah satu input bagi terjadinya proses konstruksi. Seringkali pembangunan konstruksi di suatu daerah terhambat karena masalah ketidaksiapan atau ketidaktersediaan material dan peralatan konstruksi. Tujuan kajian ini adalah memetakan permasalahan pengadaan material dan peralatan konstruksi di Indonesia agar pelaksanaan kegiatan konstruksi dapat tumbuh dengan lebih efektif. Kajian ini dilakukan dengan mengadakan survey di daerah sentra konstruksi di propinsi Indonesia, mencakup provinsi DKI Jakarta, Sumatera Utara, Sumatera Selatan, Banten, Jawa Timur, Kalimantan Timur, Sulawesi Selatan dan Papua. Dalam studi ini diadakan pengumpulan data primer dari kontraktor untuk mengkonfirmasi adanya permasalahan dari kontraktor untuk mengadakan material dan peralatan konstruksi dan persepsi mereka terhadap pemanfaatan database material dan peralatan sebagai solusinya. Dapat disimpulkan bahwa benar terdapat beberapa material dan peralatan konstruksi yang kerap sulit pengadaannya yang perlu dicarikan solusinya kedepan untuk mengatasi permasalahan tersebut, khususnya dengan mengembangkan dan memanfaatkan database material dan peralatan di Indonesia.

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# Problems in Materials and Equipment Access of Indonesian Contractors

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## 1. INTRODUCTION

Construction Equipment is one of the inputs for the construction process. The type of equipment used in construction activities can be divided into three namely: heavy equipment, testing equipment, and safety equipment. To achieve the targets in the field of infrastructure development in construction, national preparedness is required in the field of construction materials and equipment. Often the construction project is hampered due to problems of unavailability of construction materials and equipment (Clough et. al., 2005)

In addressing the 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. So therefore, the adequacy of the supply and distribution of materials and construction equipment can provide assurance on the implementation of infrastructure development in a sustainable manner (Mochtar, 2012).

The purpose of this paper is to map the problems of construction materials and equipment procurement in Indonesia so that construction activities can be held more effectively. These goals are embodied in the extent to which contractors of construction industry have developed and utilized database of materials and equipment.

## 2. PROBLEMS IN CONSTRUCTION MATERIALS AND EQUIPMENT ACCESS

Construction materials can be divided into two categories, namely direct material (cement, sand, gravel, steel, wood, brick, paint, ceramic, natural stone, and other building materials), and indirect material (air conditioning, fan, light fixture and electrical, furniture, generators, etc.). Furthermore, there is 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.). Conversely 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. There is also 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. Consequently, utilization of construction materials and equipment database is very important for construction project success in Indonesia (Mochtar, 2011).

Based on Indonesian Construction Services Development Board equipment categories, construction equipment generally may fall into 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. This business could be a stand-alone rental business, or a part of the main contractor equipment division, which also rents tools and equipment (LPJKN, 2010).

Meanwhile, in Indonesia nowadays construction projects continue to grow in terms of both volume and complexity at various levels, as seen from the large number of construction projects. An increasing number of construction projects is apparently not followed by an increase in optimizing the use of information technology in this case the construction materials and equipment database. It is reflected in the fact that 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)

### **3. METHODOLOGY**

In this study the primary data is collected from Indonesian general contractors in category of large contractor member of GAPENSI, the biggest and oldest association of contractors in Indonesia, in 8 provinces with average rate of return of 74 of 116 (63.8%), including DKI Jakarta (15 of 25), North Sumatra (12 of 13), South Sumatra (8 of 13), Banten (9 of 13), East Java (10 of 13), East Kalimantan (5 of 13), South Sulawesi (6 of 13) and Papua (8 of 13). The data is collected by the writer 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.

### **4. FINDINGS AND DISCUSSION**

In this section the result of the survey is presented. From now on, those responding contractors are called "respondents".

#### **4.1. Map of Construction Materials Procurement Problems**

From the survey it is discovered the most common materials with procurement problems and its causes. The causes are in terms of choices of 6 problems as following:

1. Domestic product is not available (need import) (P1)
2. Domestic product is not sufficient (P2)

3. No timely distribution (P3)
4. High price (P4)
5. Problems of availability of comprehensive producer/distributor information (P5)
6. Others (P6)

The three most common materials with procurement problems together with its causes (perceived by higher than 5% of respondents) are discussed and highlighted. Problem P5

**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	Reinforcement 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%
<b>Average</b>			<b>0%</b>	<b>4%</b>	<b>9%</b>	<b>3%</b>	<b>3%</b>	<b>9%</b>

(Problems of availability of comprehensive producer/distributor information) cause is specially highlighted.

From Table 1, it can be seen that the most common materials with difficult procurement are asphalt, precast, and Portland cement (PC) (perceived by 38%, 31%, and 28% of respondents respectively). Problem P6 (others) is a free text-alternative filled by respondents in the questionnaire.

### Asphalt

Procurement of asphalt is perceived the most difficult by responding Indonesian contractors, 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 may be 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 may be 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). 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**

Procurement of precasts is perceived number three the most difficult by responding Indonesian contractors, particularly by respondents in Jakarta and Papua (respectively 80% and 63%). For Jakarta, it may be caused by large demand quantity of the materials in peak demand period of time, even though there are many precasters around Jakarta, the contractors have to compete to procure precast 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). 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)**

Procurement of PC is perceived number two the most difficult by responding Indonesian contractors, particularly by respondents in Papua, South Sumatra, and Jakarta (respectively 100%, 50%, and 40% of respondents). For Papua, it may be 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 Sumatra (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). 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.

From Table 1, it is also discovered, in overall 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) 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.

## 4.2. Map of Construction Equipment Procurement Problems

From the survey it is discovered the most common equipment with procurement problems and its causes. The causes are in terms of choices of 7 problems as following:

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

The three most common equipment with procurement problems together with its causes (perceived by higher than 5% of respondents) are highlighted, and P6 (Problems of availability of comprehensive producer/distributor/rental information ) cause is specially highlighted. Problem P7 (others) is a free text-alternative filled by respondents in the questionnaire.

**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%
<b>3</b>	<b>Grader</b>	<b>22%</b>	2%	1%	2%	<b>12%</b>	3%	3%	<b>8%</b>
4	Backhoe	13%	2%	0%	1%	3%	1%	2%	8%
5	Loader	12%	2%	0%	2%	2%	1%	1%	8%
<b>6</b>	<b>Tower Crane</b>	<b>30%</b>	10%	1%	<b>7%</b>	<b>16%</b>	3%	1%	<b>8%</b>
7	Mobile Crane	20%	3%	0%	4%	9%	1%	2%	8%
<b>8</b>	<b>Dump Truck</b>	<b>29%</b>	5%	2%	4%	<b>14%</b>	1%	8%	<b>8%</b>
9	Rolling Compactor	11%	1%	1%	0%	1%	1%	1%	8%
10	Others	3%	1%	1%	3%	2%	1%	3%	0%
<b>Average</b>			<b>3%</b>	<b>1%</b>	<b>3%</b>	<b>7%</b>	<b>1%</b>	<b>2%</b>	<b>7%</b>

From Table 2, it can be seen that the most common equipment with difficult procurement are Tower Crane, Dump Truck, and Grader (30%, 29%, and 22% of respondents respectively).

### Tower Crane

Procurement of tower crane is perceived the most difficult by responding Indonesian contractors, 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). 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 materials database development and its socialization forward the importance of the database in solving this difficulty.

### **Dump Truck**

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). The difficulty of information (P5) is felt by only 1% of respondents, while in fact they still have the second most problems with dump truck 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 materials database development and its socialization forward the importance of the database in solving this difficulty.

### **Grader**

Procurement of grader is perceived the most difficult by responding contractors, 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). 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 materials database development and its socialization forward the importance of the database in solving this difficulty.

From Table 2, it is also discovered, in overall 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.

### **4.3. Policy Implications**

Based on those findings, it is highly recommended to 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.

## 5. CONCLUSION

1. The 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.
2. The 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%. Meanwhile, 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.
3. Policies on development of construction materials and equipment database should be developed to overcome Indonesian contractors problems in materials and equipment procurement.



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## BIOGRAPHICAL NOTES

- Experienced in teaching at universities (home based on Indonesia Institute of Technology- ITI), researching, and consulting (design, supervision and management) in construction areas
- Around 30 publications in various international and national journals and conferences on productivity improvement, pricing strategies, marketing expenditures, production management, and green construction issues.
- Member of National Construction Development Board (LPJKN), Indonesia Construction Experts Association (ATAKI), Indonesia Consultant Experts Societies (INTAKINDO)

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