

FIG

Presented at the FIG Working Week 2017,  
May 29 - June 2, 2017 in Helsinki, Finland

# FIG WORKING WEEK 2017

Surveying the world of tomorrow –  
From digitalisation to augmented reality

May 29 - June 2 **Helsinki Finland**



## **Problem of Green Building Construction Local Technology and Material in Indonesia**

**Krishna Mochtar, PhD**  
**Affiliation:**



**INDONESIA CONSTRUCTION EXPERTS ASSOCIATION**



**INSTITUT TEKNOLOGI INDONESIA**

# Indonesian Construction Experts Association (ATAKI)



- The largest Construction Experts Association in Indonesia
- Founded in 1999 to answer deficit of certified construction experts in Indonesia and equity with foreign construction experts
- 34 provinces (all Indonesia) Branch Office
- Members: 5,000 construction experts in Architecture, Civil, Environmental, and Mechanical Engineering
- 40,000 Construction experts certification since 2005



INDONESIA **C**ONSTRUCTION **E**XPERTS **A**SSOCIATION

# Institut Teknologi Indonesia (ITI)



- One of very few technology university in Indonesia
- Founded in 1984 by Prof Habibie (Indonesian Technology Top Figure) from Indonesia Engineers Association (PII) to answer deficit of Engineers in Indonesia
- Student Body: 5,000 students in 10 study program including in Civil Engineering, Industrial Engineering, and Agricultural Engineering Programs
- 10,000 Engineering Graduates since 1990

# CONTENTS



- Background
- Literature Review
- Methodology
- Discussion and Policy Implication
- Conclusion

# BACKGROUND



- Implementation of green building construction project in Indonesia **is not optimal**
- A subject of attention of the Government of Indonesia is **how important and strategic application of technology and the level of use of the product in the country in the implementation of green building projects**

# OBJECTIVES



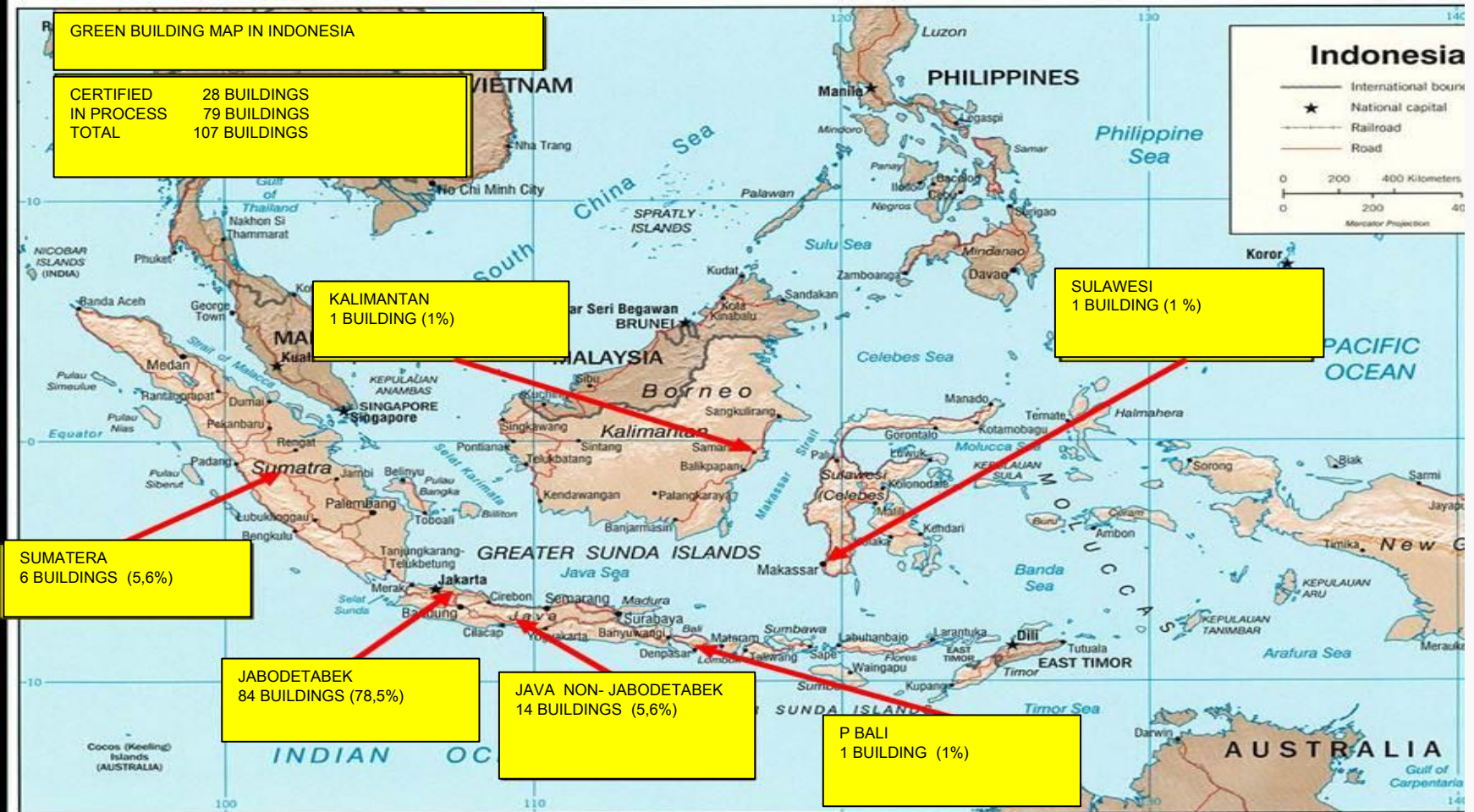
- → to discover the problem on green building construction local technology and material in Indonesia

# LITERATURE REVIEW



- Green building certification process in Indonesia **began only in the year of 2011** in line with the Regulation of Minister of Environment Number 8/2010 on Criteria and Certification of Green Building.
- Green building experts, consultants, and contractors are still **very few** in Indonesia (around 20-30 persons/institutions).
- Green buildings in Indonesia:
  - **been certified are 28 buildings**
  - **in certification process is as many as 79 buildings**
  - **the total is (only) 107 buildings**

# LITERATURE REVIEW





# COMPARISON WITH OTHERS



- When compared with the development of green building in Asean countries
    - particularly Singapore (2155 buildings began in 2005)
    - Malaysia (976 buildings began in 2009), (Mochtar et. al., 2015)
- the number of green building in Indonesia is very small.

# Table 1. Green Building Technology and Material

No	Description of Technology and Material
<b>A</b>	<b>Civil</b>
	1. Precast/prefab
	2. Steel pile
	3. Concrete pile
	4. Reinforcement steel bar
	5. Steel profile
	6. Steel Bolt
	7. Ready Mix Concrete
	8. Portland Cement
	9. Concrete Chemical Additive
	10. Concrete Formwork
<b>B</b>	<b>Architecture</b>
	1. Natural Water (river, rain) Technology Utilization
	2. Optimum Natural Illumination (lay out, building orientation, facade)
	3. Waste water recycle technology
	4. Optimum soil water absorption
	5. Bricks
	6. Non toxic wall paint
	7. Non toxic wood paint
	8. Heat insulation glass
	9. Non toxic ceiling
	10. Certified wood product
	11. Certified plywood product
	12. Water saving urinoir
	13. Water saving squatting water closet
	14. Water save sitting water closet
	15. Water saving sink
	16. Water saving kitchen sink
	17. Environmental friendly ceramic tiles product
	18. Environmental friendly roof cover product
	19. Non toxic wall finish
	20. Environmental friendly door/window hanger
	21. Environmental friendly bathroom tiles
	22. Water saving bathroom shower
<b>C</b>	<b>Mechanical</b>
	1. Water saving water sprayer
	2. Water recycle technology
	3. Mechanized and electrified natural ventilation technology
	4. Non toxic plumbing system product
	5. Water saving automated tap
	6. Energy saving and environmental friendly air condition
	7. Energy saving lift
	8. Energy saving escalator
	9. Energy saving pump system
	10. Environmental friendly waste water recycle system
	11. Environmental friendly waterproofing system
<b>D</b>	<b>Electrical</b>
	1. Solar panel technology
	2. CO2 air content detector technology
	3. Smart building (computer, software, automated equipment) technology
	4. Energy saving water heater
	5. Automated light switch with light and movement detector
	6. Energy saving light

# METHODOLOGY



## ❑ **The Survey**

- The study was by conducting survey in Jakarta, the central area of green buildings in Indonesia.
- The primary data is collected from experts, consultant, and contractors of green building projects based on their experience, to confirm the level of usage of the technology and material in their projects in terms of percentage of local technology and material, the reason (availability, price, and quality) when the level of usage is lower than 50%, and finally the solution to increase its usage in green building construction

## ❑ **Data Analysis**

- The level of usage of the technology and material in their projects in terms of percentage of local technology and material is analyzed using simple statistic analysis, namely mean score analysis of each technology and material.
- By using this analysis, both the percentage of the usage and locality of the green building construction technology and material is found, and then interpreted.



# RESEARCH FINDINGS



FIG

## FIG WORKING WEEK 2017

Surveying the world of tomorrow -  
From digitalisation to augmented reality

May 29 - June 2 **Helsinki Finland**



## Table 2. Percentage of Local Technology and Material

No	Description of Technology and Material	Level of Usage (%)	Local Percentage
<b>A</b>	<b>Civil</b>		
	1. Precast/prefab	83	73
	2. Steel pile	50	65
	3. Concrete pile	100	100
	4. Reinforcement steel bar	83	98
	5. Steel profile	83	79
	6. Steel Bolt	83	95
	7. Ready Mix Concrete	100	95
	8. Portland Cement	100	95
	9. Concrete Chemical Additive	83	5
	10. Concrete Formwork	67	100
	<b>Mean Percentage of Civil</b>	<b>83</b>	<b>81</b>
<b>B</b>	<b>Architecture</b>		
	1. Natural Water (river, rain) Technology Utilization	67	55
	2. Optimum Natural Illumination (lay out, building orientation, facade)	100	62,5
	3. Waste water recycle technology	83	52,5
	4. Optimum soil water absorption	100	55
	5. Bricks	83	80
	6. Non toxic wall paint	100	5
	7. Non toxic wood paint	100	1
	8. Heat insulation glass	83	17,5
	9. Non toxic ceiling	83	5
	10. Certified wood product	67	85
	11. Certified plywood product	67	30
	12. Water save urinoir	83	1
	13. Water save squatting water closet	67	0
	14. Water save sitting water closet	100	10
	15. Water save sink	100	5
	16. Water save kitchen sink	83	0
	17. Environmental friendly ceramic tiles product	83	80
	18. Environmental friendly roof cover product	83	60
	19. Non toxic wall finish	100	30
	20. Environmental friendly door/window hanger	83	30
	21. Environmental friendly bathroom tiles	83	80
	22. Water save bathroom shower	100	5
	<b>Mean Percentage of Architecture</b>	<b>86</b>	<b>34</b>
<b>C</b>	<b>Mechanical</b>		
	1. Water save water sprayer	83	3
	2. Water recycle technology	100	5

## Table 2. Percentage of Local Technology and Material

<b>C</b>	<b>Mechanical</b>		
	1. Water save water sprayer	83	3
	2. Water recycle technology	100	5
	3. Mechanized natural ventilation technology	67	40
	4. Non toxic plumbing system product	83	75
	5. Water save automated tap	100	10
	6. Energy save and environmental friendly air condition	100	2
	7. Energy save lift	83	0
	8. Energy save escalator	67	0
	9. Energy save pump system	83	60
	10. Environmental friendly waste water recycle system	83	20
	11. Environmental friendly waterproofing system	100	10
	<b>Mean Percentage of Mechanical</b>	<b>86</b>	<b>20</b>
<b>D</b>	<b>Electrical</b>		
	1. Solar panel technology	33	30
	2. CO2 air content detector technology	67	0
	3. Smart building (computer, software, automated equipment) technology	83	30
	4. Energy save water heater	33	70
	5. Automated light switch with light and movement detector	100	20
	6. Energy save light	100	80
	<b>Mean Percentage of Electrical</b>	<b>74</b>	<b>36</b>

# Findings and Discussion



- The green building technology and material with low (lower than 50%) local mean percentage use is in architecture (34%), mechanical (20%), and electrical (36%), with level of usage is between 33-100%
  - The lowest (0-1%) local percentages are non toxic wood paint, water saving squatting closet and kitchen sink.
- Green building construction technology and material in these categories is relatively new, and thus it is not well developed in Indonesia.

# Findings and Discussion



- The highest local mean percentage is in category civil (81%) with level of use is 83% for it is relatively not new used in Indonesia so that it has been already well developed
- The lowest usage of local civil product is concrete chemical additive product (5%) even though its high level of usage (83%).



# Table 3. Reason and Solution for the Low Usage of Local Technology and Material

No	Tchnology and Material	% Local	Reason of Low % Local			Solution
<b>CIVIL</b>						
1	Concrete Chemical Additive	5	√	Availability	√	Socialization/marketing
				Price		
			√	Quality	√	Socialization/marketing
<b>ARCHITECTURE</b>						
1	Non toxic wall paint	5		Availability		
				Price		
			√	Quality	√	Show the VOC content
2	Non toxic wood paint	1		Availability		
				Price		
			√	Quality	√	Show the Formaldehid content
3	Heat insulation glass	17,5	√	Availability	√	Socialization/marketing
				Price		
				Quality		
4	Non toxic ceiling	5	√	Availability	√	Socialization/marketing
				Price		
				Quality		
5	Water saving urinoir	1	√	Availability	√	Socialization/marketing
				Price		
			√	Quality	√	Show level of water saving
6	Water saving squatting closet	0	√	Availability	√	Technology development
				Price		
			√	Quality	√	Show level of water save
7	Water saving sitting closet	10	√	Availability	√	Socialization/marketing
				Price		
			√	Quality	√	Show level of water save
8	Water saving sink	5	√	Availability	√	Socialization/marketing
				Price		
			√	Quality	√	Show level of water save
9	Water saving kitchen sink	0	√	Availability	√	Socialization/marketing
				Price		
			√	Quality	√	Show level of water save
10	Non toxic wall finish	30	√	Availability	√	Socialization/marketing
				Price		
				Quality		
11	Water saving bathroom shower	5	√	Availability	√	Socialization/marketing
				Price		
				Quality		
<b>MECHANICAL</b>						
1	Water saving water sprayer	3	√	Availability	√	Socialization/marketing
				Price	√	Technology development for cheaper price
				Quality		
2	Water recycle technology	5	√	Availability	√	Socialization/marketing
				Price		
				Quality		
3	Mechanized natural ventilation technology	40		Availability		
				Price		
				Quality		

# Table 3. Reason and Solution for the Low Usage of Local Technology and Material

# Page 1

MECHANICAL						
1	Water saving water sprayer	3	√	Availability	√	Socialization/ marketing
			√	Price	√	Technology development for cheaper price
				Quality		
2	Water recycle technology	5	√	Availability	√	Socialization/ marketing
				Price		
				Quality		
3	Mechanized natural ventilation technology	40		Availability		
				Price		
				Quality		
4	Water saving automated tap	10		Availability		
			√	Price	√	Socialization/ marketing
			√	Quality	√	Show level of water save
5	Energy saving and environmental friendly air condition	2	√	Availability	√	Socialization/ marketing
				Price		
			√	Quality	√	Socialization/ marketing
6	Energy saving lift	0		Availability		
				Price		
			√	Quality	√	Socialization/ marketing
7	Energy saving escalator	0		Availability		
				Price		
			√	Quality	√	Socialization/ marketing
8	Environmental friendly waste water recycle system	20	√	Availability	√	Socialization/ marketing
				Price		
				Quality		
9	Environmental friendly waterproofing system	10		Availability		
				Price		
			√	Quality	√	Quality certification

ELECTRICAL						
1	Solar panel technology	30		Availability		
			√	Price	√	More competition atmosphere
				Quality		
2	CO2 air content detector technology	0	√	Availability	√	Technology development
				Price		
				Quality		
3	Smart building (computer, software, automated equipment) technology	30		Availability		
			√	Price	√	Socialization/ marketing
			√	Quality	√	Quality standard and more competition atmosphere
4	Automated light switch with light and movement detector	20	√	Availability	√	Socialization/ marketing
				Price		
				Quality		

# Findings and Discussion



- **Availability problem:**
  - **solved by socialization/marketing** for the technology and material actually exists however the users do not know their existence
    - ✦ **Civil:** concrete chemical additive
    - ✦ **Architecture:** heat insulation glass, non toxic ceiling, water saving urinoir, and water saving bathroom shower
    - ✦ **Mechanical:** water saving water sprayer, water recycle technology, energy saving and environmental friendly air condition, environmental friendly waste water recycle system
    - ✦ **Electrical:** automated light switch with light and movement detector (electrical).
  - **solved by technology development** of the material.
    - ✦ **Architecture:** Water saving squatting closet
    - ✦ **Electrical:** CO<sub>2</sub> air content detector technology (electrical).

# Findings and Discussion



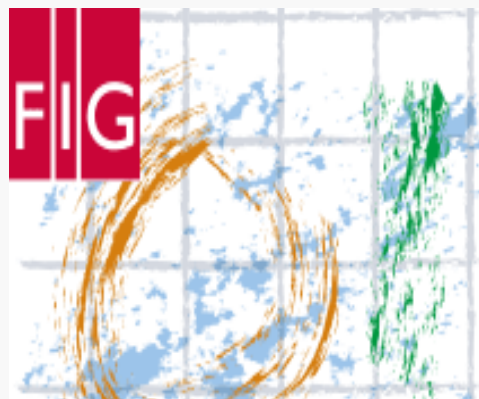
- **Price problem:**
  - **solved by socialization/marketing** for the technology and material actually with competitive price however the users do not know it.
    - ✦ **Architecture:** water saving urinoir, water saving sitting closet, water saving kitcehn sink, non toxic wall finish, water saving bathroom shower
    - ✦ **Mechanical:** water saving water sprayer, and water saving automated tap
    - ✦ **Electrical:** smart building (computer, software, automated equipment) technology
  - **Solved by developing more competition atmosphere**
    - ✦ **Electrical:** solar panel technology
  -

# Findings and Discussion



- **Quality problem:**
  - **Solved by socialization/marketing** for the technology and material actually in good quality however the users do not know it
    - ✦ **Civil:** concrete chemical additive
    - ✦ **Electrical:** energy saving and environmental friendly air condition, energy saving lift, energy saving escalator
  - **solved by showing level of green**
    - ✦ **Architecture:** non toxic wall paint (VOC content), non toxic wood paint (formaldehyd content), water saving urinoir (percentage of water saving), water saving squatting closet (percentage of water saving), water saving sitting closet (percentage of water saving), water saving sink (percentage of water saving), water saving kitchen sink (percentage of water saving), water saving bathroom shower
    - ✦ **Mechanical:** water saving tap (percentage of water saving) (mechanical)
  - **solved by development of quality certification**
    - ✦ **Mechanical:** environmental friendly waterproofing system
    - ✦ **Electrical:** smart building (computer, software, automated equipment) technology (electrical).
  -

# CONCLUSION



## FIG WORKING WEEK 2017

Surveying the world of tomorrow -  
From digitalisation to augmented reality

May 29 - June 2 **Helsinki Finland**



# CONCLUSION



- There is problem with green building technology and material such as low (lower than 50%) local mean percentage usage as in catagories of **architecture (34%)**, **mechanical (20%)**, and **electrical (36%)**, with level of usage is **between 33-100%**. On the other hand, the local mean percentage of **civil catagory is relatively better** than other catagories; it is 81% with level of usage is 83%.
- There are **reasons for the low local technology and material usage** that can be devided into three reasons: **availability**, **price**, and **quality** of the local technology and material product in green building project.

# CONCLUSION



- The solution proposed for these problems include social/marketing, developing local technology, enhancing competition atmosphere, implementing quality certification, and finally showing the level of green of the construction technology and material in green building
- As the implication, some policies are necessary to solve these problems:
  - To develop and implement the improvement program of socialization/marketing to the local technology and material product for green building that already exists with competitive price and quality by enhancing competition atmosphere.
  - To push local technology development of technology and material product that is in high usage but not yet existing.
  - To encourage quality certification and product quality equalization by showing the level of green of the technology and material product.





THANK YOU  
TERIMA KASIH

Krishna Mochtar, PhD



INDONESIA CONSTRUCTION EXPERTS ASSOCIATION



INSTITUT TEKNOLOGI INDONESIA

FIG

FIG WORKING WEEK 2017

Surveying the world of tomorrow -  
From digitalisation to augmented reality

May 29 - June 2 Helsinki Finland

