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ANALYSING CARBON STOCK DATA IN PARTICULAR MANGROVES SPECIES IN INDONESIA

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#Overview

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1. This study is a *Preliminary Study*
2. Data collected from scientific publications related to carbon in mangroves in Indonesia,
3. Unfortunately, the data collected and eligible for use so far represents only 10 locations in Indonesia
4. Total data obtained is as much as 48 data which is divided into 20 group of Mangroves species
5. Majority of scientific publications about blue carbon in particular mangroves in Indonesia is still limited

#Aim

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Our scientific understanding of the ability of various types of mangrove in absorbing carbon is inadequate. Carbon sequestration data on available mangrove species in Indonesia needs to be improved.

- Here, we map the data of various types of mangroves in terms of its ability to absorb carbon per hectare using previously published research data, so that it will look at the characteristics of the data available today.

#Method

(1) Meta Analisis

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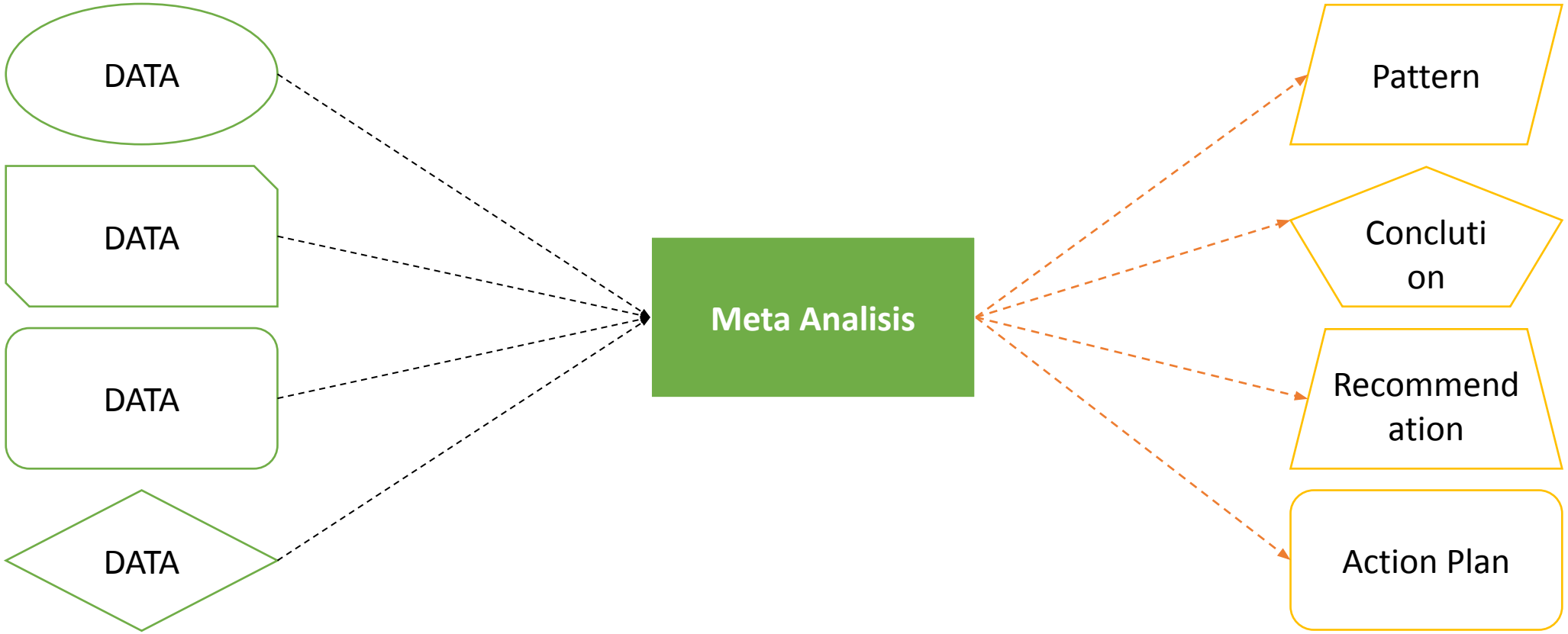

#Method

(1) Meta Analisis

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Meta Analisis

- Meta-analysis is a way of knowing the general truth behind all scientific studies that are conceptually similar, but which have been measured by certain errors in scientific studies. Meta-analysis uses a statistical approach that combines the results of some scientific research to get the closest combined estimate with unknown general truths based on how these errors are felt.
- In addition to providing an unknown general forecast of truth, meta-analyzes have the ability to differentiate the results of various studies and identify patterns among the outcomes of the study, the source of disagreement among those results, or other interesting relationships that may be revealed in the context of some studies. In essence, meta-analysis yields a weighted average of individual study results. The different is the way in which these weights are allocated and also the way in which uncertainty is calculated around the estimated point generated (Glass, 1976).
- **In this study**, meta-analysis was done by collecting and interpreting 48 data from 10 locations spread across Indonesia. The data used in this study are data that has been published scientifically, either in the form of papers / articles, reports, thesis, thesis, dissertation and books. The data are then compiled and standardized based on predetermined units, thus having an equivalent value. Furthermore, the data will be classified and analyzed according to the type of mangrove so that the characteristics of the data can be seen.

#Results

(1) Overview

- The data are grouped into 20 species:

1. *Aegicera corniculatum,*
2. *Avicennia alba,*
3. *Avicennia lanata,*
4. *Avicennia marina,*
5. *Avicennia officinalis,*
6. *Bruguiera cylindrica,*
7. *Bruguiera gymnhoriza,*
8. *Bruguiera parviflora,*
9. *Ceriops decandra,*
10. *Ceriops tagal,*
11. *Lumnitzera,*
12. *Lumnitzera littoreae,*
13. *Rhizophora apiculata,*
14. *Rhizophora mucronata,*
15. *Rhizophora stylosa,*
16. *Scyphiphora hydrophyllacea,*
17. *Sonneratia alba,*
18. *Sonneratia caseolaris*

Species	Penulis	Lokasi
Aegicera corniculatum	Eva Ariani, dkk (2016)	Kalsel
Avicenia lanata	Eva Ariani, dkk (2016)	Kalsel
Avicennia alba	Eva Ariani, dkk (2016)	Kalsel
	Rachmawati D., dkk (2014)	Bekasi
	Senoaji G. dan Hidayat M.F. (2016)	Bengkulu
Avicennia marina	Dharmawan dan Siregar (2008)	Purwakarta
	Eva Ariani, dkk (2016)	Kalsel
	Rachmawati D., dkk (2014)	Bekasi
	Afiati R.N., dkk (2013)	Banten
	Lestari T.A. (2016)	Banten
	Alongi D. M. (2012)	Indonesia*
Avicennia officinalis	Rachmawati D., dkk (2014)	Bekasi
	Heriyanto N.M. dan Subiandono E. (2012)	Jatim
Bruguiera cylindrica	Heriyanto N.M. dan Subiandono E. (2012)	Jatim
Bruguiera gymnorrhiza	Bismark et, al (2008)	Sumbar
	Eva Ariani, dkk (2016)	Kalsel
	Senoaji G. dan Hidayat M.F. (2016)	Bengkulu
	Afiati R.N., dkk (2013)	Banten
	Heriyanto N.M. dan Subiandono E. (2015)	Kalbar
Bruguiera parviflora	Eva Ariani, dkk (2016)	Kalsel
Ceriops decandra	Eva Ariani, dkk (2016)	Kalsel
Ceriops tagal	Yusuf, 2016	Sulut
	Senoaji G. dan Hidayat M.F. (2016)	Bengkulu
Lumnitzera	Eva Ariani, dkk (2016)	Kalsel
Lumnitzera littoreae	Senoaji G. dan Hidayat M.F. (2016)	Bengkulu
Rhizophora apiculata	Bismark et, al (2008)	Sumbar
	Eva Ariani, dkk (2016)	Kalsel
	Yusuf, 2016	Sulut
	Senoaji G. dan Hidayat M.F. (2016)	Bengkulu
	Heriyanto N.M. dan Subiandono E. (2015)	Kalbar
Rhizophora mucronata	Bismark et, al (2008)	Sumbar
	Eva Ariani, dkk (2016)	Kalsel
	Rachmawati D., dkk (2014)	Bekasi
	Heriyanto N.M. dan Subiandono E. (2012)	Jatim
Rhizophora stylosa	Alongi D. M. (2012)	Indonesia*
Scyphiphora hydrophyllacea	Eva Ariani, dkk (2016)	Kalsel
Sonneratia alba	Eva Ariani, dkk (2016)	Kalsel
	Rachmawati D., dkk (2014)	Bekasi
	Senoaji G. dan Hidayat M.F. (2016)	Bengkulu
	Heriyanto N.M. dan Subiandono E. (2015)	Kalbar
Sonneratia caseolaris	Rachmawati D., dkk (2014)	Bekasi
	Alongi D. M. (2012)	Indonesia*
Xylocarpus granatum	Eva Ariani, dkk (2016)	Kalsel
	Senoaji G. dan Hidayat M.F. (2016)	Bengkulu
Xylocarpus moluccensis	Heriyanto N.M. dan Subiandono E. (2012)	Jatim
	Heriyanto N.M. dan Subiandono E. (2015)	Kalbar
Grand Total		

#Results

(2) Carbon Stock In Particular Indonesian Mangroves

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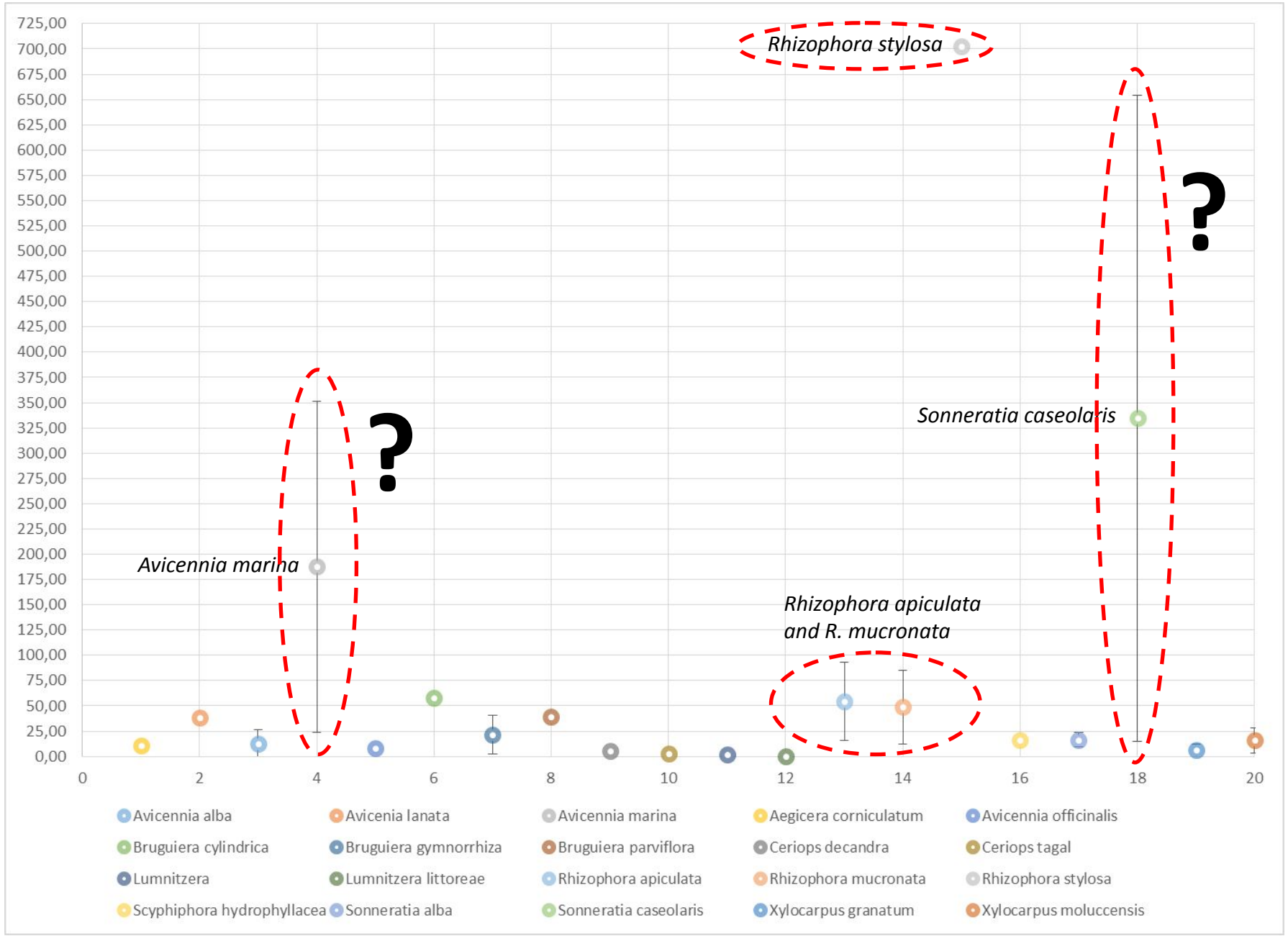
No	Species	Banten	Bekasi	Bengkulu	Jatim	Kalbar	Kalsel	Purwakarta	Sulut	Sumbar	Indonesia*	Total	Average	STDEV
1	*Aegicera corniculatum*						11,02					**11,02**	**11,02**	**0,00**
2	*Avicennia lanata*						38,61					**38,61**	**38,61**	**0,00**
3	*Avicennia alba*		2,42	3,38			32,02					**37,82**	**12,61**	**13,73**
4	*Avicennia marina*	293,16	5,27				19,98	182,5			437	**937,91**	**187,58**	**164,14**
5	*Avicennia officinalis*		6,03		9,49							**15,52**	**7,76**	**1,73**
6	*Bruguiera cylindrica*				57,83							**57,83**	**57,83**	**0,00**
7	*Bruguiera gymnorrhiza*	5		0,64		55,19	21,35			24,56		**106,74**	**21,35**	**19,24**
8	*Bruguiera parviflora*						39,36					**39,36**	**39,36**	**0,00**
9	*Ceriops decandra*						5,17					**5,17**	**5,17**	**0,00**
10	*Ceriops tagal*			0,01					5,4			**5,41**	**2,71**	**2,70**
11	*Lumnitzera*						1,5					**1,5**	**1,50**	**0,00**
12	*Lumnitzera littoreae*			0,01								**0,01**	**0,01**	**0,00**
13	*Rhizophora apiculata*			0,55		108,1	28		86,53	49,13		**272,31**	**54,46**	**38,83**
14	*Rhizophora mucronata*		17,6		108,61		19,63			49,13		**194,97**	**48,74**	**36,75**
15	*Rhizophora stylosa*										703	**703**	**703,00**	**0,00**
16	*Scyphiphora hydrophyllacea*						15,97					**15,97**	**15,97**	**0,00**
17	*Sonneratia alba*		9,01	13,85		27,97	13,99					**64,82**	**16,21**	**7,08**
18	*Sonneratia caseolaris*		15,02								654	**669,02**	**334,51**	**319,49**
19	*Xylocarpus granatum*			0,09			12,12					**12,21**	**6,11**	**6,02**
20	*Xylocarpus moluccensis*				3,46	28,27						**31,73**	**15,87**	**12,41**
	Grand Total	**298,16**	**55,35**	**18,53**	**179,39**	**219,53**	**258,72**	**182,50**	**91,93**	**122,82**	**1.794,00**	**3.220,93**		

***Note:** *) Units: ton C/ha*



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These data, showing significant differences in values of the same species, eg Sonneratia caseolaris has the largest range of values, ie 15 - 654 tC/ha followed by Avicennia marina 5 - 437 tC/ha and Rhizophora apiculata 0.5 - 108 tC/ha.

#Results

(3) Mangrove Characters

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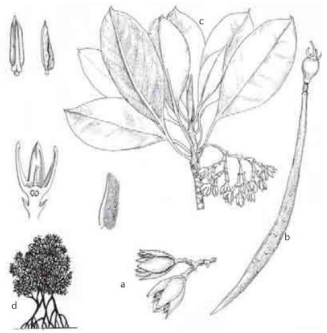
Avicennia marina

- Tinggi mencapai 30 meter
- Lebar Daun 9 x 4,5
- Akar Nafas Vertikal/Pasak
- Hidup pada substrat belumpur, berpasir dan terlindung

a. bunga; b. buah; c. daun; d. pohon

Rhizophora stylosa

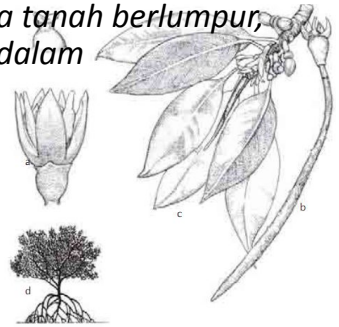
- Tinggi mencapai 10 meter
- Lebar daun 8-12 x 2-4
- Akar tunjang dan akar udara
- Hidup pada tanah basah, sedikit berlumpur, berpasir



a. bunga; b. buah; c. daun; d. pohon

Rhizophora apiculata

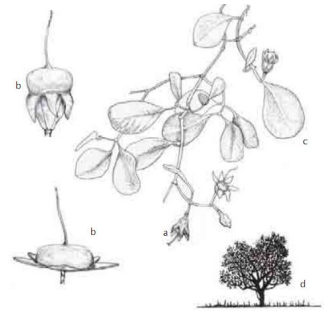
- *Tinggi mencapai 30 meter*
- *Lebar daun 7-19 x 3,5-8 cm*
- *Akar tunjang dengan ketinggian 5 meter dan akar udara*
- *Hidup pada tanah berlumpur, halus dan dalam*



a. bunga; b. buah; c. daun; d. pohon

Sonneratia alba

- Tinggi berkisar 15-20 meter
- Lebar daun 5-13 x 2-4
- Akar Nafas Vertikal/Pasak
- Hidup pada tanah berlumpur dalam



a. bunga; b. buah; c. daun; d. pohon

#Main Conclusions

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1. We report that each type of mangrove has different carbon store values.
2. From these data, there is a very significant difference in values on the same type.
3. The largest range occurred in *Sonneratia caseolaris* 15-654 tC / ha (stdev: 319,49), followed by Avicennia marina 5-437 tC / ha (stdev:164,14) and Rhizophora apiculata 0.5-108 tC / ha (stdev:38,83). Whereas the carbon calculation method used was in accordance with existing standards.
4. This indicates that there are variables that have not been taken into account in the method of calculating carbon in mangrove that has been standard now, such as the variable of environmental characteristics, morfologi and age.
5. In addition, it also indicates that research on blue carbon is still not well consolidated.

#Recommendation

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1. Finding the very basic problem of the apparent differences between existing carbon storage research data;
2. Review or re-examine the standard standard calculation of carbon deposits on mangrove and / or data retrieval methods, so it is expected that standard deviation between carbon data on mangrove can be minimized. This is in accordance with the results of the study obtained, where there are differences in carbon storage values are significantly different in the same type of mangrove;
3. Conduct further research using more data.