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Pro-Environmental Behavior and Social Capital in Indonesia 2021: A Micro Data Analysis

Winda Sartika Purba[1,2], Deni Kusumawardani[1*]

[1] Faculty of Economics and Business, Universitas Airlangga, Surabaya 60286, Indonesia
[2] Directorate of Social Resilience Statistics, BPS-Statistics Indonesia, Jakarta 10710, Indonesia

Corresponding Author Email: deniku@feb.unair.ac.id

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ABSTRACT

Pro-environmental behavior (PEB) is one of the individual efforts to provide public goods. This study differs from previous research in three basic aspects, starting from a multidimensional approach that simultaneously considered different PEB (energy savings, vehicle use, waste reduction, and water savings), included social capital as measured by 26 indicators, and the development of the PEB index and social capital with the CATPCA. Based on the data of 2021 Happiness Level Measurement Survey by Statistics Indonesia, this study found that social capital is an important and significant driver of PEB. In particular, social participation had the greatest effect followed by trust in government, trust in neighbors and tolerance. Other factors showed varying results; PEB was displayed more by women than men, rural people than urban people and people with a partner than those without. In addition, PEB improved with older age while increase in income and education decreased PEB. Based on the findings, this study suggested the government to take part in promoting an increase in social capital through the implementation of various joint activities/events in the neighborhood. In addition, the government and environmental protection organization can begin to voice the cost savings that can be achieved with PEB.

1. INTRODUCTION

Improving the quality of the environment is one of the development agendas in Indonesia as stated in the National Medium Term Development Plan (RPJMN) 2020-2024. The National Development Planning Agency in Indonesia (2019) stated that the sustainability of Indonesia's economic growth, which currently still relies on the commodity and natural resource sectors, is highly dependent on the quality of the environment [1].

The quality of the environment in Indonesia is reflected in the value of the Environmental Performance Index (EPI) in 2020, which showed Indonesia ranking 116th out of 180 countries with a score of 37.8 out of a maximum score of 100 [2]. Indonesia's EPI score was in the poor category and below neighboring countries, namely Singapore (Rank 39 with a score of 58.1) and Malaysia (Rank 68 with a score of 47.9) [2]. This EPI result may indicate that the quality of the environment in Indonesia is in poor condition. This condition must receive attention and improving the quality of the environment as expected in the RPJMN is a shared responsibility because environmental quality is a public property [3]. One of the causes of poor EPI rank is the indifference toward environment, thus, people are expected to contribute and not become free riders (behave indifferent to the environment) which will lead to the sub-optimal provision of public goods [3].

Pro-environmental behavior (PEB) encompasses behaviors that do not harm the environment, but benefit it instead [4]. It is generally accepted that the adoption of PEB can have a great impact on the effort to halt environmental damage, including climate change mitigation [5-7]. Therefore, identifying factors for PEB is important. Various theoretical and methodological approaches have made progress in the study of concern for the environment in recent years.

This progress includes more complex models and broader factors, starting from economic and socio-demographic aspects that are generally used to explain the causes or triggers for PEB [8-11]. Other factor such as social capital are still very rarely studied at the global level in relation to PEB [8]. This kind of research has never been done in Indonesia, despite the aspect of social capital providing a strong impetus for PEB [8-14].

The measurement of complex social capital and PEB uses several dimensions/indicators. In general, there are four main dimensions/indicators, namely social trust, institutional trust, adherence to social norms, and social participation in social networks [15-18], while PEB consists of energy efficiency, waste and recycling, water efficiency, and water efficiency [19]. Next, these dimensions/indicators are measured using composite indicators/indexes [20-25].

The index measurement of previous studies used the average value [20] and the sum [21, 23] without looking at the possibility of each dimension/indicator making a different contribution. In addition, some researchers use Principal Component Analysis (PCA) or factor analysis [22-25] even though the data used are ordinal data, and PCA requires numerical scale data (intervals or ratios). Therefore, categorical Principal Component Analysis (CATPCA) has been developed to overcome the limitations of PCA [26].

This study differs from previous research in three basic aspects. First, the study focused on a multidimensional

approach that simultaneously considered different PEB ranging from energy savings, vehicle use, waste reduction, and water savings. Second, the factors studied did not only cover socio-economic aspects, but also included social capital (social participation, trust in the government, trust in neighbors and tolerance) as measured by 26 indicators. Third, the development of the PEB index and social capital with the CATPCA. The rest of the paper is arranged as follows: Section 2 is a literature review, showing the main factors considered in previous studies. In Section 3, we indicate the data sources, define variables, and the methodological components of the index calculation. Section 4 is the analysis of the results and Section 5 finishes with some concluding remarks and suggestions.

2. LITERATURE REVIEW

PEB does not yet have a general definition, however, some researchers define PEB as a behavior that can contribute to reducing environmental burdens. Basically, there are two options for defining PEB, namely goal-oriented and fact-oriented definitions [27]. In this study, PEB is defined in a fact-oriented manner without looking at the goal of the behavior. The behavior of a person choosing the stairs instead of the elevator because they are aware of their health is categorized as PEB. The behavior does not serve any purpose related to environmental awareness, although it actually contributes to the reduction of the environmental burden.

The most important factor driving PEB is social capital [23, 25] and an important determinant of individual attitudes in reducing environmental damage [8]. In addition, social capital is an intangible resource and leads to being responsible for the environment [28, 29]. However, Grafton and Knowles [30] showed different results, where statistically social capital had little impact on the environment.

The definition of social capital has not been widely agreed upon, however, general trends in the relevant literature are identified in various dimensions [15-18]. In general, there are four main dimensions, namely social trust, institutional trust, adherence to social norms, and social participation in social networks [15-18].

Social trust is associated with the perception that other members of society act in the same way to protect the common goods [31, 32]. The propensity of social members to have faith in one another is a sign of social trust and illustrates how deep the social ties are between the two parties [24]. As a result, during the implementation of environmental policies, the level of social trust will influence the perception that the majority of the community will comply with the regulations and will cooperate so as to ultimately influence individual behavior. Su et al. [23] and Zhou et al. [25] showed that social trust increases environmental protection, and in line with that, Wan and Du [24] demonstrated an increase in PEB in the private sector. Jin [20] showed different results for each PEB (social beliefs encourage recycling behavior, buying organic food, reducing energy and car use but not encouraging responsible water use behavior). In addition, there are research results that showed the insignificant effect of this factor on PEB [22, 28].

The most common definition of institutional trust is citizens trust in legal institutions, such as government institutions or the justice system [24]. Institutional trust also affects behavior towards the environment [33], this relationship can be seen in three aspects. First, the perception of the level of effectiveness of environmental policies and the legitimacy of the responsible actors. Second, the effectiveness of external controls is mainly related to law-and-order institutions. Third, it affects the level of acceptance of information regarding environmental issues and the level of perceived reliability [34, 35]. Jin [20] showed different results for each PEB (institutional beliefs encourage behavior to buy organic food, reduce energy and use cars but do not encourage recycling behavior and responsible water use).

Social norms are an unofficial system that regulates moral behavior while encouraging subject-level agreement on concepts and intents [24]. Individual norms are activated, according to Schwartz [36], when individual behavior cognition and responsibility cognition are higher. In order to further adopt pro-environmental conduct, it is believed that a belief is created between humans and the environment that will internally activate personal social norms [37]. Some people thought that the formal system would quickly alter one's conduct, whilst others thought that social norms would influence inhabitants' views toward the environment and encourage greater environmental cooperation [38]. Group norms, according to White et al. [39], also had a favorable effect on pro-environmental behavior. In conclusion, social norms influence people to act ethically toward the environment. Environmentally friendly actions should be taken everywhere.

Social participation refers to the method by which people actively engage in social events and communicate with others who can help them emotionally and socially [24]. Social participation in social networks may also have a significant effect. The network serves as a channel of information, transmitting knowledge that allows for benefits for the implementation of public policy [33, 40] and thus strengthens arguments about the need to implement policies. Furthermore, close social networks are important for increasing social participation and public awareness of environmental issues [41]. Wan and Du [24] showed that social participation increased PEB, in line with this Macias and Williams [22] specifically showed that participating in religious activities increases PEB (buying chemical-free products and avoiding non-green products). In addition, Zhou et al. [25] showed that social networks and social participation improved PEB (garbage sorting).

3. DATA AND METHODS

The data used in this study is data produced by Statistics Indonesia. Surveys related to PEB are available for 2013, 2014, 2017 and 2021, but PEB indicators and measurements each year are different. In addition, indicators of PEB and social capital are measured together only in 2021. Therefore, this study used the data of 2021 Happiness Level Measurement Survey by Statistics Indonesia. The unit of analysis in this study was the head of family or their partner (n=69,482).

PEB was measured through (1) energy saving, consisting of the use of energy-saving lamps, the behavior of turning off lights, turning off the TV, utilizing sunlight, buying electronic devices with low electrical power, and closing pots; (2) saving water, consisting of washing clothe habit, washing eating/drinking utensils, using used water and turning off the tap; (3) the use of vehicles, consisting of the means of transportation used, the purchase of motorized vehicles and reducing the use of private vehicles; and (4) waste

management, consisting of garbage sorting, using used goods and shopping bag.

Social capital was measured using four dimensions and respondents (head of family/partner) provided answers from strongly disagree (code 1) to strongly agree (code 11) for 26 questions regarding, among others:

1. mutual trust in neighbors with 2 variables, including trust in getting help from neighbors in times of disaster or emergency (neighbor1) and trust in neighbors who will help watch the house when it is empty (neighbor 2).
2. trust in government with 8 variables, including trust in the local neighborhood head/management (gov1), village officials (gov2), district/city government officials (gov3), provincial government officials (gov4), central government (gov5), election results (gov6), elected state officials in elections (gov7), and the National Police (gov8).
3. social participation with 10 variables, including involvement in community service or mutual cooperation activities (participation 1), being present at the funeral home when there is a death in the neighborhood (participation 2), being present at a community meeting (participation 3), willing to be appointed as a committee for certain celebration events (participation 4), respect and obey the results of the deliberation (participation 5), willing to be active in raising funds for disaster victims (participation 6), willing to be a respondent to surveys/censuses organized by the government (participation 7), supporting solidarity actions (demonstrations) that voice the public interest in a peaceful manner (participation 8), participating in elections/local elections (participation 9), participate in supporting the national COVID 19 vaccination program (participation 10).
4. tolerance with 6 variables, including letting other people to carry out their religious rituals (tolerance 1), feeling entitled to control or limiting the activities of other minority citizens (tolerance 2), having good friendships with one ethnic group (tolerance 3), development policies prioritized on the majority religious group (tolerance 4), development policies prioritized on indigenous ethnic groups (tolerance 5), and tendency to be averse toward people who debated/refuted the opinions/views of respondents (tolerance 6).

The study was processed using SPSS 22, using two relevant methods according to the type of data used. PEB was measured by Likert scale (1-4) and categories (1-2 and 1-3) and social capital measurement was in the form of ordinal data from 1 to 11. Therefore, CATPCA was applied to accommodate nominal and ordinal data. In general, CATPCA performs better than PCA for categorical scale data and shows results that explain greater variance than using PCA [42]. In this study, CATPCA was used to reduce indicators and calculate the weight of each indicator to form a composite index.

The results of the calculation were followed by the formation of a model that explained the effect of each dimension of social capital on PEB. The PEB index that was formed first was classified into three categories, namely don't care, care enough and care. To date, there are no standard criteria in categorizing the PEB index. Therefore, this study used the Jenks natural breaks classification (Jenks). Categories with this classification were based on the natural groupings inherent in the data [43-46]. The Jenks method used a classification-based optimization method, the category boundary was identified as the best value from groups that had similar values and maximized the difference between classes [43].

Table 1. The results of categorical principal component analysis of PEB

Variable	VAF	Factor Loading				Weight	Contribution
		1	2	3	4		
Turning off lights (4 “always”; 3 “often”; 2 “sometimes”; 1 “never”)	0.6337	0.0116	0.7957	0.0106	-0.0193	0.0593	0.1009
Turning off the TV (4 “always”; 3 “often”; 2 “sometimes”; 1 “never”)	0.5877	0.1287	0.7531	0.0372	-0.0517	0.0561	0.0955
The means of transportation used (4 “do not use vehicles or non-motorized vehicles”; 3 “public motorized vehicles with certain routes”; 2 “non-routed public motorized vehicles”; 1 “private motorized vehicles”)	0.6612	0.8071	-0.0080	0.0468	-0.0865	0.0620	0.1054
The purchase of motorized vehicles (4 “environmentally friendly/never buy a vehicle motorized"; 3 “fuel-efficient but does not consider environmentally friendly”; 2 “convenience and safety but does not consider environmentally friendly and fuel efficient”; 1 “only considers the price/model/brand and others”)	0.5644	0.7488	0.0261	0.0136	-0.0531	0.0575	0.0978
Reducing the use of private vehicles (2 “yes”; 1 “no”)	0.4525	0.6559	-0.0160	0.0038	0.1485	0.0504	0.0857
Garbage sorting (4 “always”; 3 “often”; 2 “sometimes”; 1 “never”)	0.5779	0.0294	0.0132	-0.0717	0.7561	0.0599	0.1019
Shopping bag (4 “always”; 3 “often”; 2 “sometimes”; 1 “never”)	0.5931	-0.0144	-0.0098	0.0295	0.7693	0.0609	0.1037
Washing the clothes (4 “rinse 1-2 times”; 3 “twin tub front-loading washing machines”; 2 “single tub front-loading washing machines or rinse >2 times; 1 “ running water)	0.6756	-0.0713	0.0255	0.8182	0.0197	0.0666	0.1133
Washing the dishes (3 “water is collected in several containers”; 2 “water is collected in a container then rinsed with running water”; 1 “running water)	0.6560	0.1289	-0.0115	0.7968	-0.0653	0.0649	0.1104
Turning off the tap (4 “always”; 3 “often”; 2 “sometimes”; 1 “never”)	0.4764	-0.1278	0.6741	-0.0288	0.0694	0.0502	0.0855
Eigen value		1.698	1.657	1.315	1.208		
Varians		16.9814	16.567	13.151	12.085		

The formed PEB index category resulted in the analysis of the influence of social capital being carried out using the ordinal logistic regression method. This regression was one of the analytical methods that can be used to analyze the dependent variable in the form of ordinal-scale discrete data [47]. In addition, the model also used control variables in the form of socio-economic variables (age, gender, household income, employment status, area of residence, and length of residence).

PEB was described by 15 indicators. These behaviors were then formed into an index number to simplify multidimensional indicators using CATPCA. The index formation procedure used several stages, first starting with reducing the indicator based on the Variance Accounted For (VAF) value. The final result of the selection of indicators resulted in 10 index composing behaviors, and the lowest VAF value was 45.25, which means that the minimum indicator criteria are in the good category [42]. Second, indicators that have met the requirements are carried out through the CATPCA process. The result of the four components formed was an eigenvalue greater than one and the total cumulative explained variance was 58.78, this means that the four components formed could explain 58.78 percent of the phenomena studied (PEB). Third, the loading value obtained was greater than 0.4 (Table 1 column 4-7). Fourth, the index was calculated with unequal weight so that each indicator has a different contribution to PEB index.

The order of the contribution of the lowest to the highest indicators was indicated by the green gradation in Table 1 column 9. The contribution between indicators did not differ much from the lowest of 8.55 percent (turning off the faucet behavior) to the highest of 11.33 percent (behavior of washing clothes). Fifth, aggregation of the weight of each indicator with the indicator value. The last stage, PEB index was grouped into three based on the Jenks classification. The results of the categorization resulted in the categories of don't care (PEB index 61.88), care enough (61.88<PEB index 72.48) and care (PEB index>72.88).

Social capital was measured from 26 indicators that would be formed into index numbers with the same stages as the formation of PEB index. First, the final result of the selection of indicators resulted in 24 indicators making up the index, the lowest VAF value was 50.60. Second, the calculation using CATPCA produced an eigenvalue greater than one and the cumulative total explained variance was 68.09. Third, the loading value obtained was greater than 0.4 (Table 2 column 4-7). Fourth, the calculation of the index in the order of the smallest to the largest indicator contributions was shown from the increasingly green color gradation in Table 2 column 9, the contribution between indicators was quite varied, starting from the smallest of 2.35 percent (indicator of participation 9/participating in elections) to the largest of 7.87 percent (indicator of neighbor1/trust in getting help from neighbors in times of disaster/emergency). Fifth, the aggregation of the weights of each indicator with the overall indicator value and in each dimension.

Table 2. The results of categorical principal component analysis of social capital

Variable		VAF	Factor Loading				Weight	Contribution
			1	2	3	4		
Trust in neighbors	neighbor1	0.7834	0.2417	0.2705	0.1168	0.7989	0.0536	0.0787
	neighbor2	0.7341	0.2920	0.2481	0.1023	0.7595	0.0509	0.0748
Trust in government	gov1	0.6470	0.6386	0.2320	0.0806	0.4230	0.0242	0.0356
	gov2	0.7161	0.7393	0.2204	0.0686	0.3409	0.0281	0.0412
	gov3	0.8102	0.8447	0.2359	0.0777	0.1869	0.0321	0.0471
	gov4	0.8169	0.8559	0.2408	0.0799	0.1411	0.0325	0.0477
	gov5	0.7629	0.8227	0.2447	0.1072	0.1208	0.0312	0.0459
	gov6	0.7132	0.7882	0.2729	0.0860	0.0998	0.0299	0.0439
	gov7	0.7503	0.8208	0.2573	0.0744	0.0694	0.0311	0.0458
	gov8	0.7052	0.7784	0.2693	0.0867	0.1389	0.0295	0.0434
Social participation	participation1	0.6452	0.2246	0.6241	0.1044	0.4409	0.0201	0.0295
	participation2	0.6406	0.1903	0.5592	0.1134	0.5281	0.0180	0.0264
	participation3	0.6623	0.2379	0.7166	0.0857	0.2914	0.0231	0.0339
	participation4	0.6095	0.1935	0.7542	0.0419	0.0387	0.0243	0.0357
	participation5	0.5534	0.3139	0.6233	0.1641	0.1987	0.0201	0.0295
	participation6	0.6668	0.2518	0.7646	0.1119	0.0790	0.0246	0.0361
	participation7	0.5518	0.2905	0.5990	0.1498	0.2936	0.0193	0.0283
	participation8	0.5407	0.3014	0.6545	0.1237	0.0785	0.0211	0.0309
	participation9	0.5060	0.2395	0.4981	0.2001	0.4006	0.0160	0.0235
Tolerance	tolerance2	0.6969	0.0890	0.1056	0.8189	0.0846	0.0301	0.0442
	tolerance3	0.7065	0.0662	0.1430	0.8110	0.1547	0.0298	0.0438
	tolerance4	0.8153	0.0719	0.0918	0.8939	0.0514	0.0329	0.0483
	tolerance5	0.7752	0.0687	0.0837	0.8726	0.0461	0.0321	0.0471
	tolerance6	0.5312	0.0911	0.1097	0.7142	0.0269	0.0263	0.0386
Eigen value			5.728	4.476	3.629	2.508		
Varians			23.8659	18.6490	15.1195	10.4519		

4. RESULTS AND DISCUSSION

The general description in Table 3 from data of 2021 Happiness Level Measurement Survey by Statistics Indonesia (n=69.482) shows that the population is dominated by women. Most of them are married, graduated from elementary school, work, have income in the category of Rp. 1,800,001-Rp. 3,000,000, and live in urban areas. In addition, the average age of the population was 47.74 years with a length of stay of 31.09 years. The resulting index showed that the average PEB index only reached 65.88 out of 100, while the social capital index reached 73.33 out of 100. The components of social capital

show that the highest average index was trust in neighbors (81.77), followed by social participation (75.50), trust in the government (74.74), and finally the tolerance index (62.58).

The estimation results in Table 4 show that almost all independent variables in the model had a significant effect on PEB index except for employment status and length of residence. In addition, the effect of each variable showed a different direction. Social capital, gender (women) and age showed a positive effect. However, the increase in income, marital status, increase in education, and urban areas have a negative effect on PEB index.

The marginal effect in Table 5 was based on the results of the regression model II in Table 4 column 3. The results of the marginal effect of socio-economic variables in model II (using the social capital index) were consistent with the marginal effect using the trust in neighbor index (model III), trust in government index (model IV), social participation index (model V), and tolerance index (model VI).

Table 3. Descriptive analysis

Variable	Mean	Modus	S.D.	Min.	Max.
PEB index	65.88	-	8.66	30.05	97.24
Social capital index	73.33	-	8.25	30.08	100.00
Trust in neighbors index	81.77	-	11.26	9.09	100.00
Trust in government index	74.74	-	11.44	10.94	100.00
Social participation index	75.50	-	10.64	9.09	100.00
Tolerance index	62.58	-	18.04	9.09	100.00
Income 0. ≤ Rp 1.800.000 1. Rp 1.800.001-Rp 3.000.000 2. Rp 3.000.001-Rp 4.800.000 3. Rp 4.800.001-Rp 7.200.000 4. > Rp 7.200.000	-	1	-	0	4
Female Female=1, male=0	-	1	-	0	1
Age (Year)	47.74	-	13.47	14	98
Married Married with spouse=1; other marital status=0	-	1	-	0	1
Education level 0. < Primary school 1. Primary school 2. Junior high school 3. High school 4. College and above	-	1	-	0	4
Employed Employed = 1, unemployed=0	-	1	-	0	1
Urban Urban=1, rural=0	-	1	-	0	1
Length of residence (Year)	31.09	-	19.81	0	98

Notes: Sampling weights were used.

Table 4. Ordered logit model results of social capital on PEB

Variables	Coefficient					
	I	II	III	IV	V	VI
Isoscap		0.8837*** (0.1251)				
Ineighbor			0.4008*** (0.0891)			
Igov				0.4151*** (0.0899)		
Iparticipation					0.4953*** (0.0986)	
Itolerance						0.2514*** (0.0554)
D_income1	-0.3299*** (0.0267)	-0.3329*** (0.0268)	-0.3299*** (0.0267)	-0.3290*** (0.0268)	-0.3320*** (0.0267)	-0.3332*** (0.0267)
D_income2	-0.5286*** (0.0303)	-0.5323*** (0.0303)	-0.5295*** (0.0303)	-0.5270*** (0.0303)	-0.5311*** (0.0303)	-0.5331*** (0.0303)
D_income3	-0.5863*** (0.0401)	-0.5942*** (0.0403)	-0.5889*** (0.0402)	-0.5879*** (0.0402)	-0.5902*** (0.0402)	-0.5914*** (0.0402)
D_income4	-0.5549*** (0.0430)	-0.5676*** (0.0430)	-0.5608*** (0.0431)	-0.5577*** (0.0431)	-0.5619*** (0.0430)	-0.5615*** (0.043)
D_female	0.5885*** (0.0224)	0.5874*** (0.0224)	0.5866*** (0.0224)	0.58260*** (0.0224)	0.5985*** (0.0225)	0.5873*** (0.0224)
Age	0.0188*** (0.0010)	0.01870*** (0.0010)	0.01890*** (0.0010)	0.01870*** (0.0010)	0.01910*** (0.0010)	0.0187*** (0.0010)

D_married	-0.27***	-0.2810***	-0.2743***	-0.2739***	-0.2837***	-0.2700***
	(0.0286)	(0.0287)	(0.0286)	(0.0286)	(0.0287)	(0.0286)
D_educ1	-0.1381***	-0.1458***	-0.1378***	-0.1389***	-0.1464***	-0.1423***
	(0.0315)	(0.0315)	(0.0315)	(0.0315)	(0.0315)	(0.0315)
D_educ2	-0.2284***	-0.2404***	-0.2288***	-0.2283***	-0.2406***	-0.236***
	(0.0368)	(0.0368)	(0.0368)	(0.0368)	(0.0369)	(0.0367)
D_educ3	-0.2945***	-0.3130***	-0.2963***	-0.2949***	-0.3120***	-0.3062***
	(0.0364)	(0.0364)	(0.0364)	(0.0364)	(0.0365)	(0.0363)
D_educ4	-0.2388***	-0.2716***	-0.2457***	-0.2458***	-0.2654***	-0.2544***
	(0.0460)	(0.0461)	(0.0461)	(0.0460)	(0.0463)	(0.0461)
D_employed	-0.0019	-0.0080	-0.0031	-0.0026	-0.0095	-0.0036
	(0.0242)	(0.0242)	(0.0242)	(0.0242)	(0.0242)	(0.0242)
D_urban	-0.1102***	-0.0979***	-0.1012***	-0.1026***	-0.1026***	-0.1103***
	(0.0204)	(0.0204)	(0.0205)	(0.0204)	(0.0205)	(0.0204)
Length_ residence	0.0005	0.0004	0.0002	0.0004	0.0004	0.0005
	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)
/cut1	-0.3049	0.3106	0.0152	-0.0086	0.05950	0.05950
	(0.0719)	(0.114)	(0.1013)	(0.0965)	(0.1016)	(0.1016)
/cut2	1.7268	2.3447	2.0478	2.0242	2.0924	2.0924
	(0.0724)	(0.115)	(0.1021)	(0.0973)	(0.1023)	(0.1023)
n	69.482	69.482	69.482	69.482	69.482	69.482
Prob > chi^2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R^2	0.0420	0.0426	0.0422	0.0423	0.0423	0.0422

Notes: Income reference categories (D_income): ≤ Rp 1.800.000; D_income1: 1.800.001-3.000.000; D_income2: 3.000.001-4.800.000; D_income3: 4.800.001-7.200.000; D_income4: > Rp 7.200.000. Educational reference category (D_educ): < Primary school; D_educ1: Primary education; D_educ2: Junior high school; D_educ3: High school; D_educ4: College and above. Sampling weights were used. The values in parentheses indicate the standard error. *** p<0.01, ** p<0.05, * p<0.1.

Table 5. Ordered logit model results of marginal effects of social capital on PEB

Variables	Marginal Effect PEB		
	Don't Care	**Care Enough**	**Care**
Isoscap	-0.1943*** (0.0275)	0.0463*** (0.0068)	0.1480*** (0.0209)
Ineighbor	-0.0881*** (0.0196)	0.0210*** (0.0047)	0.0671*** (0.0149)
Igov	-0.0913*** (0.0198)	0.0217*** (0.0048)	0.0695*** (0.015)
Iparticipation	-0.1089*** (0.0217)	0.0259*** (0.0053)	0.0830*** (0.0165)
Itolerance	-0.0553*** (0.0122)	0.0132*** (0.003)	0.0421*** (0.0093)
D_income1	0.0746*** (0.0061)	-0.0208*** (0.002)	-0.0538*** (0.0042)
D_income2	0.1221*** (0.0072)	-0.0406*** (0.0031)	-0.0815*** (0.0043)
D_income3	0.1389*** (0.0098)	-0.0522*** (0.0049)	-0.0867*** (0.005)
D_income4	0.1330*** (0.0105)	-0.0505*** (0.0053)	-0.0824*** (0.0054)
D_female	-0.1290*** (0.0049)	0.0312*** (0.0016)	0.0978*** (0.0037)
Age	-0.0041*** (0.0002)	0.0010*** (0.0001)	0.0031*** (0.0002)
D_married	0.0597*** (0.0059)	-0.0103*** (0.0008)	-0.0495*** (0.0053)
D_educ1	0.0323*** (0.007)	-0.0083*** (0.0019)	-0.0240*** (0.0051)
D_educ2	0.0542*** (0.0085)	-0.0157*** (0.0029)	-0.0385*** (0.0056)
D_educ3	0.0705*** (0.0084)	-0.0205*** (0.0028)	-0.0501*** (0.0056)
D_educ4	0.0618*** (0.0108)	-0.0192*** (0.0041)	-0.0426*** (0.0068)
D_employed	0.0017 (0.0053)	-0.0004 (0.0013)	-0.0013 (0.0041)
D_urban	0.0215*** (0.0045)	-0.0050*** (0.0011)	-0.0165*** (0.0034)
Length_ residence	-0.0001 (0.0002)	0.0000 (0.0000)	0.0001 (0.0001)

Notes: The marginal effects reported in Table 5 are based on the regression results in column (3) of Table 4, basically consistent with the marginal effects using trust in neighbors, trust in government, social participation, and tolerance as explanatory variables. The marginal effect results based on columns (4-7) of Table 4 are presented in Appendix 1 and 2. Sampling weights were used. The values in parentheses indicate the standard error. ***p<0.01, **p<0.05, *p<0.1.

In Table 5, the increase in the social capital index (isoscap) resulted in the population's probability not to care about the environment decreased by 19.43 percent, the probability to care about the environment increased by 5.63 percent and the probability to care about the environment increased by 14.80 percent. Among the four components of social capital, the social participation index (iparticipation) had the greatest effect. The increase in the social participation index resulted in the population's probability not to care about the environment decreased by 10.89 percent, the probability to be concerned enough about the environment increased by 2.59 percent and the probability to care about the environment increased by 0.83 percent. The trust in neighbor index (ineighbor) and government (igov) had a fairly similar effect, but below the effect of social participation index.

These findings in general give empirical evidence to support several previous studies saying that social capital gives the greatest impetus to promote PEB [23, 25]. The high influence of social capital on PEB is possible because residents with higher social capital interact more often with friends or neighbors. Interaction in social participation provides opportunities for collaboration which in turn encourages social learning [25] as well as serves as an information channel that transmits knowledge [33, 40] which in turn improves social participation and community awareness of environmental issues [41].

Social capital brings residents closer to their living environment and forms a stronger sense of social identity [25]. In addition, high mutual trust between residents will lead to the perception that others will do the same (contribute to

environmental protection) for the common good [31, 32]. This behavior is in line with Brekke et al.'s [48] model of moral motivation showing that residents who contribute to public goods (through PEB) are motivated by moral "calculation" rather than self-interest. This model showed that residents benefit from being considered socially responsible and ultimately consider their behavior. Thus, residents pay more attention to environmental conditions and show behavior that affects the provision of public goods (environmental quality).

Socio-economic factors gave mixed results. Based on the marginal effect value, when compared to respondents with an income of Rp 1,800,000, residents in the higher income categories are more likely to not care about the environment. On the other hand, the higher the income category, the lower the probability of caring for the environment. This finding differs from several previous studies [25, 49, 50]. Several studies used various PEB behaviors and the results showed different effects of increasing income on each PEB [51-53]. The results of the study showed that respondents with lower income were more likely to report daily activities, such as saving water, saving energy, repairing damaged equipment or reusing goods rather than discarding them at once [54]. This suggests that this behavior has more to do with financial need than deliberate choice [54-56].

The results of this study are in line with the study of Lavelle et al. [54], because 7 of the 10 indicators that make up PEB index showed behaviors related to financial needs, such as water saving (washing behavior and turning off the faucet), electricity saving (turning off lights and turning off the TV), and fuel saving (transportation facilities and reducing vehicle use). Several researchers also concluded that the increase in household income resulted in residents not considering the costs of being environmentally indifferent (becoming free riders), especially in the context of excessive use of electricity and water [57] and the decision to use private vehicles [58].

An increase in the level of education shows the same results as an increase in the level of income. Based on the marginal effect value, when compared to people who did not finish elementary school, people with higher levels of education seem to have a higher chance of not caring about the environment. This finding contrasts several previous studies [8, 50, 59, 60]. However, in line with Lavelle et al. [54], the behavior of respondents with a low level of education tends to show PEB (saving water, saving energy, repairing damaged equipment or reusing goods rather than discarding them at once). Various studies also showed that an increase in education level reduces the behavior of turning on the TV, turning off the lights and using public transportation [61]. In addition, an increase in the level of education is believed to result in additional information related to environmental issues, but a higher level of education does not necessarily mean improved PEB [62].

The marginal effect value on the gender variable (women) showed that women have 9.78 percent higher change than men to care about the environment. This is in line and consistent with the majority of previous studies [13, 60, 63, 64]. Women tend to be more environmentally oriented than men because women have a stronger ethic of caring and social responsibility [65]. As a result, women show greater care or concern toward provision of public goods/environmental quality [66].

The marginal effect value on the age variable showed that older age reduced the probability of not caring about the environment by 0.41 percent and increased the probability of caring enough about the environment by 0.10 percent and caring about the environment by 0.31 percent. These findings are in line with several previous studies [49, 60, 67]. Younger people believe that technological advances should be able to solve environmental problems in the future [68] so they do not feel the need to take responsibility for caring for the environment (free riders). In contrast to this, the older population's concern for future generations motivates them to improve the quality of the environment for the next generation [50].

The marginal effect value on the marital status variable showed that married population has 5.97 percent greater chance to care about the environment compared to those who are single/divorced/divorce by death (no partner). These findings contrast previous studies [19, 60, 69]. Another study that is in line with these findings found that the presence of a partner does not encourage PEB, single respondents have greater probability to participate socially in waste sorting, bag recycling and environmental volunteering than married respondents [70].

The marginal effect value of the area of residence variable (city) showed that people who live in cities have 2.15 percent greater change of not caring about the environment compared to those who live in rural areas. This contrasts several previous studies [59, 70, 71]. However, other studies showed a higher concern for people in rural areas than people in medium and large cities [63, 72]. In addition, small cities (or "rural") have higher value of environmental care than people in big cities [8].

Research in the western context showed that urban residents have a higher attitude and concern for the environment than rural residents because urban residents are often exposed to greater environmental degradation [73, 74]. This means that exposure to poor environmental conditions leads to concern for the environment [75]. Exposure to poor environmental conditions (environmental degradation) in Indonesia has a different trend from that in the west.

Employment status showed that working population has less chance of caring about the environment than those who are unemployed, albeit insignificant. It is suspected that the status of employed or unemployed does not affect a person's decision to care about the environment. This finding differs from several previous studies [13, 70, 76]. However, several studies similar results with these findings that employment status have no significant effect on PEB [8, 77].

Longer length of residence will result in greater concern toward the environment, albeit not significant. This might be because length of residence does not explain one's decision to care about the environment. This result differs from several previous studies [16, 78]. The study by Scannell and Gifford [79] showed that the relationship between place attachment and PEB was unclear. In addition, Takahashi and Selfa [80] showed identical results with this finding that length of residence is not significant in predicting PEB using dichotomous variables (less than 10 years or more than 10 years). In Indonesia, the average length of stay is quite high, reaching 31.09 years. This may be the cause of the insignificant results in this study. Takahashi and Selfa [80] considered the findings to be insignificant due to the use of dichotomous variables and most of the respondents (more than 80 percent) lived in their community for more than 10 years. The findings using continuous data for length of residence in Indonesia turned out to give the same results for PEB.

5. CONCLUSIONS AND SUGGESTIONS

The population shows relatively low concern for the environment (PEB index 65.88 out of 100) with the largest contribution to the formation of PEB index is water saving behavior. Social capital is the most important factor influencing PEB. In particular, social participation has the greatest influence, followed by trust in the government, trust in neighbors and tolerance. Social capital causes residents to feel socially responsible by participating in contributing to the provision of public goods (environmental quality). Good environmental quality is ultimately for the common good.

Women show concern for the environment, especially because the indicators that make up PEB index are more likely to portray behavior at home that women tend to do. In addition, older population shows concern for the environment which may be because young people believe in technological advances to solve environmental problems so they tend not to be involved in PEB (free riders). However, older population considers the environmental quality (involved in the provisions of public goods) for future generations.

With these results, it is hoped that the government will participate in increasing social capital (social participation, trust between neighbors, trust in the government, and tolerance) in order to foster PEB through the implementation of various joint activities/events in the neighborhood. Joint activities accompanied by the provision of information related to environmental concerns will improve PEB. Joint activities focused on activities/organizations that are attended by many women and older people will further encourage PEB. In addition, the government can integrate the concept of environmental protection into social values so as to increase the sense of responsibility towards environmental protection. People will feel moral when implementing PEB and vice versa feel immoral if they do not care about the environment.

Increased income lowers PEB because 7 out of 10 behaviors are more related to financial needs such as saving water (washing and turning off the faucet), saving electrical energy (turning off lights and turning off the TV) and fuel savings (transportation facilities and reducing vehicle use). This shows that population in the low-income category contributes more to the provisions of public goods (environment quality) than people in the high-income category. With this finding, it is hoped that the government and environmental protection organizations can begin to voice the cost savings that can be obtained by conducting PEB, especially the behavior of saving electricity and water.

The presence of partners (married people) does not encourage PEB. This might be because the majority of population in Indonesia with unmarried status (single/divorced/divorced by death) are old (78.63 percent in this category over 47 years old) and female (72.27 percent). Higher levels of education do not improve PEB. People living in rural areas show concern toward the environment compared to those living in the city. Employment status and length of residence do not explain someone's decision to practice PEB.

A few limitations of this study must be acknowledged; these limitations imply some suggestions as well. It must be noted that The PEB used does not contain motivation/reasoning of people to practice PEB and is only observed strictly from the behaviors. Future studies, especially those that use primary data, need to include the variable of motivation to behave in PEB. In addition, the knowledge of the population regarding the environment also needs to be studied together to show how literacy affects PEB.

Social capital has the greatest effect on PEB; however, this study does not cover why some people have higher social capital than others. Therefore, future studies are hoped to determine factors shaping social capital.

Data used were only cross-section data since data related to PEB by Statistics Indonesia keep evolving in terms of measurements, indicators used to differences in observed behavioral observation units (individual behavior or household behavior) that PEB comparison cannot be performed. In addition, PEBs behaviors with dynamic effect, thus, the analysis should also be dynamic.

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NOMENCLATURE

CATPCA	categorical principal component analysis
D_educ	less than primary school;
D_educ1	primary education
D_educ2	junior high school
D_educ3	high school
D_educ4	college and above.
D_income	≤ Rp 1.800.000
D_income1	1.800.001-3.000.000
D_income2	3.000.001-4.800.000
D_income3	4.800.001-7.200.000
D_income4	> Rp 7.200.000
EPI	environmental performance index
gov1	trust in the local neighborhood head/management
gov2	trust in village officials
gov3	trust in district/city government officials
gov4	trust in provincial government officials
gov5	trust in central government
gov6	trust in election results
gov7	trust in elected state officials in elections
gov8	trust in national police
Igov	government index
Ineighbor	neighbor index
Iparticipation	social participation index
Isoscap	social capital index
Jenks	jenks natural breaks classification
neighbor1	trust in getting help from neighbors in times of disaster or emergency
neighbor2	trust in neighbors who will help watch the house when it is empty
participation1	involvement in community service or mutual cooperation activities
participation10	participate in supporting the national COVID 19 vaccination program
participation2	being present at the funeral home when there is a death in the neighborhood
participation3	being present at a community meeting

participation4	willing to be appointed as a committee for certain celebration events	tolerance1	letting other people to carry out their religious rituals
participation5	respect and obey the results of the deliberation	tolerance2	feeling entitled to control or limiting the activities of other minority citizens
participation6	willing to be active in raising funds for disaster victims	tolerance3	having good friendships with one ethnic group
participation7	willing to be a respondent to surveys/censuses organized by the government	tolerance4	development policies prioritized on the majority religious group
participation8	supporting solidarity actions (demonstrations) that voice the public interest in a peaceful manner	tolerance5	development policies prioritized on indigenous ethnic groups
participation9	participating in elections/local elections	tolerance6	tendency to be averse toward people who debated/refuted the opinions/views of respondents
PCA	principal component analysis		
PEB	pro-environmental behavior	VAF	variance accounted for
RPJMN	national medium term development plan		

APPENDIX

Appendix 1. Ordered logit model results of marginal effects of social capital on PEB (1)

Variable	Marginal Effect PEB					
	Don't Care	Care Enough	Care	Don't Care	Care Enough	Care
Ineighbor	-0.0881*** (0.0196)	0.021*** (0.0047)	0.0671*** (0.0149)			
Igov				-0.0913*** (0.0198)	0.0217*** (0.0048)	0.0695*** (0.015)
D_income1	0.0739*** (0.0061)	-0.0206*** (0.002)	-0.0533*** (0.0042)	0.0737*** (0.0061)	-0.0205*** (0.002)	-0.0532*** (0.0042)
D_income2	0.1215*** (0.0072)	-0.0403*** (0.0031)	-0.0811*** (0.0043)	0.1209*** (0.0072)	-0.0401*** (0.0031)	-0.0808*** (0.0043)
D_income3	0.1376*** (0.0098)	-0.0516*** (0.0049)	-0.0861*** (0.005)	0.1374*** (0.0098)	-0.0514*** (0.0049)	-0.0859*** (0.005)
D_income4	0.1313*** (0.0105)	-0.0497*** (0.0052)	-0.0816*** (0.0054)	0.1306*** (0.0105)	-0.0493*** (0.0052)	-0.0812*** (0.0054)
D_female	-0.1288*** (0.0049)	0.0311*** (0.0016)	0.0977*** (0.0037)	-0.1279*** (0.0049)	0.0309*** (0.0016)	0.0971*** (0.0037)
Age	-0.0041*** (0.0002)	0.001*** (0.0001)	0.0032*** (0.0002)	-0.0041*** (0.0002)	0.001*** (0.0001)	0.0031*** (0.0002)
D_married	0.0583*** (0.0059)	-0.0101*** (0.0008)	-0.0482*** (0.0053)	0.0583*** (0.0059)	-0.0101*** (0.0008)	-0.0482*** (0.0053)
D_educ1	0.0306*** (0.007)	-0.0078*** (0.0019)	-0.0227*** (0.0051)	0.0308*** (0.007)	-0.0079*** (0.0019)	-0.0229*** (0.0051)
D_educ2	0.0515*** (0.0085)	-0.0148*** (0.0028)	-0.0367*** (0.0057)	0.0514*** (0.0085)	-0.0148*** (0.0028)	-0.0366*** (0.0057)
D_educ3	0.0667*** (0.0083)	-0.0192*** (0.0028)	-0.0475*** (0.0056)	0.0664*** (0.0083)	-0.019*** (0.0028)	-0.0473*** (0.0056)
D_educ4	0.0558*** (0.0107)	-0.017*** (0.0039)	-0.0388*** (0.0069)	0.0558*** (0.0107)	-0.017*** (0.0039)	-0.0388*** (0.0069)
D_employed	0.0007 (0.0053)	-0.0002 (0.0013)	-0.0005 (0.0041)	0.0006 (0.0053)	-0.0001 (0.0013)	-0.0004 (0.0041)
D_urban	0.0222*** (0.0045)	-0.0052*** (0.0011)	-0.017*** (0.0034)	0.0225*** (0.0045)	-0.0052*** (0.0011)	-0.0173*** (0.0034)
Length_ residence	-0.0001 (0.0002)	0.0000 (0.0000)	0.0000 (0.0001)	-0.0001 (0.0002)	0.0000 (0.0000)	0.0001 (0.0001)

Notes: Sampling weights were used. The values in parentheses indicate the standard error. *** p < 0.01, ** p < 0.05, * p < 0.1.

Appendix 2. Ordered logit model results of marginal effects of social capital on PEB (2)

Variable	Marginal Effect PEB					
	Don't Care	Care Enough	Care	Don't Care	Care Enough	Care
Iparticipation	-0.1089*** (0.0217)	0.0259*** (0.0053)	0.083*** (0.0165)			
Itolerance				-0.0553*** (0.0122)	0.0132*** (0.003)	0.0421*** (0.0093)

D_income1	0.0744***	-0.0208***	-0.0536***	0.0747***	-0.0208***	-0.0538***
	(0.0061)	(0.002)	(0.0042)	(0.0061)	(0.002)	(0.0042)
D_income2	0.1219***	-0.0405***	-0.0814***	0.1223***	-0.0407***	-0.0816***
	(0.0072)	(0.0031)	(0.0043)	(0.0072)	(0.0031)	(0.0043)
D_income3	0.1379***	-0.0517***	-0.0862***	0.1382***	-0.0519***	-0.0864***
	(0.0098)	(0.0049)	(0.005)	(0.0098)	(0.0049)	(0.005)
D_income4	0.1316***	-0.0498***	-0.0818***	0.1315***	-0.0498***	-0.0817***
	(0.0105)	(0.0052)	(0.0054)	(0.0105)	(0.0052)	(0.0054)
D_female	-0.1314***	0.0317***	0.0997***	-0.129***	0.0311***	0.0978***
	(0.0049)	(0.0016)	(0.0037)	(0.0049)	(0.0016)	(0.0037)
Age	-0.0042***	0.001***	0.0032***	-0.0041***	0.001***	0.0031***
	(0.0002)	(0.0001)	(0.0002)	(0.0002)	(0.0001)	(0.0002)
D_married	0.0603***	-0.0103***	-0.05***	0.0575***	-0.01***	-0.0474***
	(0.0059)	(0.0008)	(0.0053)	(0.0059)	(0.0008)	(0.0053)
D_educ1	0.0325***	-0.0083***	-0.0241***	0.0316***	-0.0081***	-0.0235***
	(0.0071)	(0.002)	(0.0051)	(0.007)	(0.0019)	(0.0051)
D_educ2	0.0542***	-0.0157***	-0.0385***	0.0532***	-0.0154***	-0.0378***
	(0.0085)	(0.0029)	(0.0056)	(0.0085)	(0.0029)	(0.0056)
D_educ3	0.0703***	-0.0204***	-0.0499***	0.069***	-0.0199***	-0.049***
	(0.0084)	(0.0028)	(0.0056)	(0.0083)	(0.0028)	(0.0056)
D_educ4	0.0604***	-0.0187***	-0.0417***	0.0578***	-0.0177***	-0.0401***
	(0.0108)	(0.004)	(0.0068)	(0.0108)	(0.004)	(0.0068)
D_employed	0.0021	-0.0005	-0.0016	0.0008	-0.0002	-0.0006
	(0.0053)	(0.0013)	(0.0041)	(0.0053)	(0.0013)	(0.0041)
D_urban	0.0225***	-0.0052***	-0.0173***	0.0242***	-0.0056***	-0.0186***
	(0.0045)	(0.0011)	(0.0034)	(0.0045)	(0.0011)	(0.0034)
Length_ residence	-0.0001	0.0000	0.0001	-0.0001	0.0000	0.0001
	(0.0002)	(0.0000)	(0.0001)	(0.0002)	(0.0000)	(0.0001)

Note: Sampling weights were used. The values in parentheses indicate the standard error. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.