

**Texts S1:** *Factors influencing the awareness and utilization of blue carbon ecosystem services*

The socio-demographic characteristics of the residents were regressed on the awareness level of BCE services to examine the associations of these variables (Tables 1a and 1b). The multiple regressions showed that the socio-demographics of Busuanga can be associated with a few ES such as recognition of cultural services of mangroves ( $R^2 = 0.127$ ,  $p < 0.01$ ) and seagrasses as a nursery, feeding, and breeding ground ( $R^2 = 0.050$ ,  $p < 0.10$ ), food source ( $R^2 = 0.141$ ,  $p < 0.01$ ), and establish good water quality ( $R^2 = 0.054$ ,  $p < 0.10$ ). However, looking at the  $\beta$  coefficients, the occupation of the residents has positive correlations with their awareness level. For example, Fishermen have high recognition that mangroves can serve as nursery, feeding, and breeding ground ( $\beta = 0.309$ ), protect coastal areas ( $\beta = 0.297$ ), and seagrasses as a food source ( $\beta = 0.237$ ), and establish good water quality ( $\beta = 0.477$ ). Conversely, the age, residency, and gender of the respondents are negatively correlated with some of the ES. For instance, the younger age of the respondents, the higher their perceptions are ( $\beta = -0.191$ ) while the longer they lived in the area, the less their recognitions are ( $\beta = -0.288$ ). In contrast, Karimunjawa has more significant associations (Table 1a-1b); for example, the socio-demographics can be regressed with their awareness of mangroves as a food source ( $R^2 = 0.556$ ,  $p < 0.01$ ), establish good water quality ( $R^2 = 0.310$ ,  $p < 0.01$ ), and sequester and store carbon ( $R^2 = 0.467$ ,  $p < 0.01$ ), and seagrasses as coastal protectors ( $R^2 = 0.223$ ,  $p < 0.01$ ), natural buffer ( $R^2 = 0.255$ ,  $p < 0.01$ ) and sequester and store carbon ( $R^2 = 0.411$ ,  $p < 0.01$ ). Moreover, the  $\beta$  coefficients in Karimunjawa also showed contrasting results with Busuanga, occupation of the respondents is negatively correlated with their awareness while age, residency, and gender are positively correlated (Table 1a-1b).

Multivariate regressions between the socio-demographics and utilization patterns in Busuanga did not show clear associations compared with Karimunjawa (Table 2a-2b). In

Busuanga, only the utilization of mangroves for research or educational purposes can be regressed with respondents' demographics ( $R^2 = 0.107$ ,  $p < 0.01$ , Table 2a) while no significant results for seagrass utilization (Table 2b). In addition, the occupation and age of the locals showed few positive  $\beta$  coefficients. For instance, more fishermen will result to high utilization trends of mangroves and seagrasses as an income source while a smaller number of fishermen will result to low utilization yields. Meanwhile, in Karimunjawa, regression analysis showed strong associations between the variables. The locals' demographics can influence their utilization behavior of provisioning and cultural services of mangroves (food source -  $R^2 = 0.915$ ,  $p < 0.01$ , income source -  $R^2 = 0.875$ ,  $p < 0.01$ , firewood materials -  $R^2 = 0.099$ ,  $p < 0.10$ , bird or bat watching site -  $R^2 = 0.551$ ,  $p < 0.01$ , paddling site -  $R^2 = 0.454$ ,  $p < 0.01$ ) and seagrasses (food source -  $R^2 = 0.860$ ,  $p < 0.01$ , income source -  $R^2 = 0.838$ ,  $p < 0.01$ , site for bird watching -  $R^2 = 0.357$ ,  $p < 0.01$ , and snorkeling site -  $R^2 = 0.399$ ,  $p < 0.01$ ).

Lastly, correlation analysis was used to assess the relationship of respondents' awareness level with their utilization behavior. Results showed positive associations between the two variables in the study sites (Table 3a – 3b). For example, in Busuanga, high (low) perception of provisioning and cultural services of BCEs will result in more (less) frequent utilization of services like fishing for consumption and recreational activities in mangroves ( $\rho = 0.255$ ,  $\rho = 0.287$ , respectively) and in seagrasses ( $\rho = 0.320$ ,  $\rho = 0.227$ , accordingly). Meanwhile in Karimunjawa, higher (lower) recognition of the benefit they can get from these habitats, the more (less) common they use them for income generation (mangroves -  $\rho = 0.659$ , seagrasses -  $\rho = 0.599$ ), food source (mangroves -  $\rho = 0.591$ , seagrasses -  $\rho = 0.511$ ), paddling site ( $\rho = 0.293$ ), and snorkeling site ( $\rho = 0.432$ ). Other significant correlations with utilization include awareness of regulating services of the BCEs.

**Table S1a.** Multiple linear regressions of socio-demographic profile and awareness level of mangroves' ecosystem services.

Independent variables -socio-demographics	Dependent variables - awareness level (standardized $\beta$ and significance)							
	A	B	C	D	E	F	G	H
<b>Busuanga (n=98)</b>								
Age	-0.191*							
Gender								
Male					-0.204*			-0.364***
Female								
Residency		-0.203**		-0.203*				
Education								
Occupation								
Fisherman	0.309**			0.297**	0.398**	0.263*		0.288**
Farmer					0.203**			
Employed								
Housewife								
<b>Model statistics</b>								
Multiple R								0.458
Adjusted R <sup>2</sup>								0.127
p-value								< 0.01
<b>Karimunjawa (n=47)</b>								
Age								
Gender								
Male			0.311**					
Female								
Residency					0.272*			
Education								
Occupation								
Fisherman	-0.361**	-0.380**	-0.735***			-0.683***	-0.728***	
Farmer								
Employed	-0.441**	-0.399**	-0.423***			-0.285*	-0.583***	
Housewife			-0.243*				-0.282*	
<b>Model statistics</b>								
Multiple R			0.803			0.661	0.755	
Adjusted R <sup>2</sup>			0.556			0.310	0.467	
p-value			< 0.01			< 0.01	< 0.01	

Notes: Ecosystem services include (A) nursery, feeding, and breeding ground, (B) habitat, (C) food provision, (D) coastal protection, (E) natural buffer, (F) establishes good water quality, (G) carbon sequestration, and (H) cultural services.

\* $p < 0.10$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$ ; only statistically significant  $\beta$  coefficients are shown.

**Table S1b.** Multiple linear regressions of socio-demographic profile and awareness level of seagrasses' ecosystem services.

Independent variables -socio-demographics	Dependent variables - awareness level (standardized $\beta$ and significance)							
	A	B	C	D	E	F	G	H
<b>Busuanga</b>								
Age								
Gender								
Male			-0.279**	-0.205*	-0.275**		-0.251**	-0.253**
Female								
Residency			-0.288***					
Education								
Occupation								
Fisherman	0.360**	0.278*	0.237*	0.326**	0.248*	0.477***	0.304**	
Farmer						0.210*		0.203*
Employed						0.306**		
Housewife						0.348**		
<b>Model statistics</b>								
<i>Multiple R</i>	0.373		0.472			0.378		
<i>Adjusted R<sup>2</sup></i>	0.050		0.141			0.054		
<i>p-value</i>	< 0.10		< 0.01			< 0.10		
<b>Karimunjawa</b>								
Age				0.356**	0.360***			
Gender								
Male								
Female								
Residency		0.261*		0.264*	0.282**			0.295*
Education								
Occupation								
Fisherman		-0.331*	-0.539***	-0.421***	-0.438***	-0.590***	-0.709***	
Farmer								
Employed	-0.345*	-0.389**	-0.549***			-0.282*	-0.557***	
Housewife			-0.321*					
<b>Model statistics</b>								
<i>Multiple R</i>			0.743	0.602	0.624	0.604	0.723	
<i>Adjusted R<sup>2</sup></i>			0.446	0.223	0.255	0.225	0.411	
<i>p-value</i>			< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	

Notes: Ecosystem services include (A) nursery, feeding, and breeding ground, (B) habitat, (C) food provision, (D) coastal protection, (E) natural buffer, (F) establishes good water quality, (G) carbon sequestration, and (H) cultural services.

\* $p < 0.10$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$ ; only statistically significant  $\beta$  coefficients are shown.

**Table S2a.** Multiple linear regressions of socio-demographic profile and utilization frequency of mangroves' provisioning and cultural services.

Independent variables (Socio-demographics)	Dependent variables - utilization frequency (standardized $\beta$ and significance)					
	A	B	C	D	E	F
Busuanga	Age					0.221**
	Gender					
	Male					
	Female					
	Residency					
	Education					
	Occupation					
	Fisherman	0.275*	0.408***			
	Farmer					0.305***
	Employed			0.277*		
Housewife		0.274*	0.458***			
<b>Model statistics</b>						
<i>Multiple R</i>						0.437
<i>Adjusted R<sup>2</sup></i>						0.107
<i>p-value</i>						< 0.01
Karimunjawa	Age					
	Gender					
	Male					
	Female					
	Residency				0.244**	
	Education					
	Occupation					
	Fisherman	-0.825***	-0.740***	-0.336**	-0.514***	-0.526***
	Farmer					
	Employed	-0.908***	-0.908***	-0.471***	-0.671***	-0.601***
Housewife	-0.473***	-0.491***		-0.357**	-0.319*	
<b>Model statistics</b>						
<i>Multiple R</i>	0.975	0.957	0.508	0.801	0.748	
<i>Adjusted R<sup>2</sup></i>	0.915	0.875	0.099	0.551	0.454	
<i>p-value</i>	< 0.01	< 0.01	< 0.10	< 0.01	< 0.01	

Notes: Use of provisioning and cultural services includes (A) fishing for own consumption, (B) fishing for income source, (C) harvesting as firewood materials, (D) using as recreational site for bird or bat watching, (E) using as site for paddling activities, (F) using as a research or educational site.

\* $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ ; only statistically significant  $\beta$  coefficients are shown.

**Table S2b.** Multiple linear regressions of socio-demographic profile and utilization frequency of seagrasses' provisioning and cultural services.

Independent variables (Socio-demographics)	Dependent variables - utilization frequency (standardized $\beta$ and significance)				
	A	B	C	D	E
Busuanga	Age				
	Gender				
	Male				
	Female				
	Residency				
	Education				
	Occupation				
	Fisherman		0.262*		
	Farmer				
	Employed				
Housewife					
<b>Model statistics</b>					
	<i>Multiple R</i>				
	<i>Adjusted R<sup>2</sup></i>				
	<i>p-value</i>				
Karimunjawa	Age				
	Gender				
	Male				
	Female				
	Residency				-0.217*
	Education				
	Occupation				
	Fisherman	-0.758***	-0.719***	-0.460***	-0.472***
	Farmer				
	Employed	-0.944***	-0.895***	-0.653***	-0.620***
Housewife	-0.503***	-0.488***	-0.314*	-0.312*	
<b>Model statistics</b>					
	<i>Multiple R</i>				
	<i>Adjusted R<sup>2</sup></i>				
	<i>p-value</i>				

Notes: Use of provisioning and cultural services includes (A) fishing for own consumption, (B) fishing for income source, (C) using as recreational site for bird watching, (D) using as site for snorkeling activities, (E) using as a research or educational site.

\* $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ ; only statistically significant  $\beta$  coefficients are shown.

**Table S3a.** Correlations of locals' awareness and utilization of mangroves' ecosystem services.

	Ecosystem services	Fishing (own consumption)	Fishing (income source)	Firewood materials	Bird or bat watching site	Paddling site	Educational site
Busuanga (n=98)	Nursery, feeding, breeding ground					0.225**	
	Habitat	0.278***		0.304***	0.194*	0.443***	
	Food provision	0.255***		0.250***		0.381***	
	Coastal protection	0.200**			0.254***	0.198**	
	Natural buffer	0.337***	0.297***	0.214**		0.300***	
	Establish good water quality	0.353***	0.377***	0.351***	0.282***	0.228**	
	Carbon sequestration	0.192*	0.299***	0.251***	0.274***	0.305***	
	Cultural services	0.261***	0.283**			0.287***	0.171*
	Karimunjawa (n=47)	Nursery, feeding, breeding ground	0.418***	0.474**		0.574***	0.356***
Habitat		0.428***	0.434**		0.549***	0.293**	
Food provision		0.591***	0.659***	0.305**	0.592***	0.483***	
Coastal protection					0.260*		
Natural buffer					0.343**		-0.306**
Establish good water quality		0.432***	0.413***		0.378***	0.352**	
Carbon sequestration		0.639***	0.646***	0.262*	0.615***	0.504***	
Cultural services					0.311**		

\* $p < 0.10$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$ ; only statistically significant correlations are shown

**Table S3b.** Correlations of locals' awareness and utilization of seagrasses' ecosystem services.

	Ecosystem services	Fishing (own consumption)	Fishing (income source)	Bird watching site	Snokerling site	Educational site
Busuanga (n=98)	Nursery, feeding, breeding ground	0.198**		0.266***	0.376***	
	Habitat	0.257***	0.217**	0.239**	0.252***	
	Food provision	0.320***	0.255***	0.181*	0.305***	
	Coastal protection		0.234**	0.297***	0.265***	
	Natural buffer	0.280***	0.411***	0.184*	0.279***	0.209**
	Establish good water quality	0.355***	0.318***	0.174*		
	Carbon sequestration	0.218**	0.343***	0.179*	0.200**	
	Cultural services	0.240**	0.251***		0.227**	
Karimunjawa (n=47)	Nursery, feeding, breeding ground	0.359***	0.436***	0.473***	0.432***	-0.260*
	Habitat	0.389***	0.452***	0.375***	0.283**	-0.279**
	Food provision	0.511***	0.599***	0.510***	0.515***	
	Coastal protection		0.263*	0.300**		-0.415***
	Natural buffer		0.299**	0.278*		-0.433***
	Establish good water quality	0.327**	0.452***	0.248*	0.346***	
	Carbon sequestration	0.483***	0.563***	0.300**	0.424***	
	Cultural services					

\* $p < 0.10$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$ ; only statistically significant correlations are shown