Regional Studies in Marine Science 45 (2021) 101820

Contents lists available at ScienceDirect

Regional Studies in Marine Science

journal homepage: www.elsevier.com/locate/rsma

Linking blue carbon ecosystems with sustainable tourism: Dichotomy of urban–rural local perspectives from the Philippines

Jay Mar D. Quevedo [a], Yuta Uchiyama [b], Ryo Kohsaka [b,*]

[a] Graduate School of Environmental Studies, Tohoku University, Aoba-6-6 Aramaki, Aoba Ward, Sendai City, Miyagi, 980-0845, Japan
[b] Graduate School of Environmental Studies, Nagoya University, D2-1(510), Furo-cho, Chikusa-ku, Nagoya, 464-8601, Japan

ARTICLE INFO

Article history:
Received 1 June 2020
Received in revised form 28 February 2021
Accepted 1 May 2021
Available online 4 May 2021

Keywords:
Blue carbon ecosystems
Sustainable tourism
Perceptions
Local communities
Urban–rural setting
Philippines

ABSTRACT

Blue carbon ecosystems (BCEs) are linked to tourism industry either as the main destination site or as additional features. Achieving sustainable tourism in coastal areas warrants the inclusion of long-term BCE management and protection, hence, it is important to understand how tourism impacts these resources to better formulate apt strategies tailored to the individual contexts. In Busuanga Island, Philippines, where tourism industry depends highly on its coastal and marine resources, there is a gap in understanding the impacts of tourism on BCEs. Thus, this study aims to analyze communities' perceptions of sustainable tourism and BCE services by comparing household survey results between urban (Coron) and rural (Busuanga) communities. Specifically, this work aims to determine residents' perceptions of tourism impacts at the personal and community levels, to examine whether socio-demographic profiles, ecological consciousness, awareness of programs for sustainable tourism, and ecological protection drive these perceptions, and to compare these results in urban and rural settings. Results of this study indicate a distinctive difference between urban and rural perceptions; e.g., residents perceived highly of tourism benefits and impacts in Coron whereas fewer recognitions are observed in Busuanga. Correlations of locals' awareness of BCE services with perceived environmental changes caused by tourism showed positive effects. Environment-related plans received high recognition in promoting sustainable tourism. Overall, locals' perceptions of tourism and blue carbon ecosystems can be bundled together. This linkage could address future planning of sustainable tourism master plan at the municipal level particularly those towns that features coastal resources as their main tourism attractions.

1. Introduction

1.1. Blue carbon ecosystems

Mangroves, seagrasses, and tidal marshes, collectively known as the blue carbon ecosystems (BCEs), are highly productive ecosystems that provide various ecosystem services (ES), such as provision of foods, goods and habitat of commercially important species (Mukherjee et al., 2014), coastal protection (Alongi, 2008), and cultural services (Uddin et al., 2013). They also serve a vital role in climate change mitigation through carbon sequestration (Duarte et al., 2005; McLeod et al., 2011). Despite the benefits they provide, there has been a global decline of these coastal resources which are mostly due to conversion to other land uses (Duarte et al., 2013). The degradation of these environments can cause CO2 emissions back to the atmosphere contributing to global warming (Pendleton et al., 2012). Protecting these coastal resources is an effective mitigation measure to reduce greenhouse gas emissions as well as enhance carbon sinks (Duarte et al., 2013).

An increase in the efforts to the study and review of BCE with implications to its sustainable management has been observed. Recent developments include but not limited to, carbon stock assessments (e.g., Cuellar-Martines et al., 2019), blue carbon payoffs as economic incentives for ecosystems' conservation and protection (e.g., Muenzel and Martino, 2018), monetizing blue carbon credits for climate market mechanisms (e.g., Vanderklift et al., 2019), review of policies (e.g., Lukman et al., 2019), and perceptions of blue carbon ES (e.g., Quevedo et al., 2020a,b; Lukman et al., 2020).

1.2. Tourism overview

Tourism is widely perceived to be an integral economic factor that could enhance the quality of life through employment opportunities, economic diversity, natural and cultural attractions, outdoor recreation and get-together opportunities, and boosting food

* Corresponding author.
E-mail addresses: quevedojaymar@gmail.com (J.M.D. Quevedo), uchiyama.yuta@k.mbox.nagoya-u.ac.jp (Y. Uchiyama), kohsaka@hotmail.com (R. Kohsaka).

https://doi.org/10.1016/j.rsma.2021.101820
2352-4855/

and hospitality industries (Andereck et al., 2005). Cultural services including recreation and tourism of mangroves (e.g., Avau et al., 2011), saltmarshes (Salt Marshes, 2017), and seagrasses ecosystems (Wawo et al., 2014) are known and often listed in scientific reviews, however, these services received little scrutiny (Nordlund et al., 2018; Spalding and Parrett, 2019).

Although tourism is an important economic booster to a community, it can also negatively impact the environment particularly the vulnerable ecosystems including BCEs (Andereck et al., 2005). As listed by Sunlu (2003), environmental impacts of tourism include scarcity of water (particularly for small islands and islets) and local resources, land degradation, air, noise, and aesthetic pollution, solid waste and littering and sewage issues, and physical impacts (e.g., developments, land-use conversions). Examples of tourism negative impacts to BCEs include how constructed ports could lead to eutrophication of coastal waters, which is a major threat to seagrass ecosystems (e.g., Fortes and Santos, 2004) and mangrove loss due to coastal developments of tourism facilities (e.g., Brenner et al., 2018). In addition to these direct impacts, there is the possibility that local policies and plans will shift their focus in catering to the short term needs of tourists, frequently disregarding the (indirect) effect on the environment in longer terms (Andereck et al., 2005).

1.3. Community perceptions

The framework of ES is an integral part of natural resource management because it involves understanding the relationship between ecosystems and human behavior (Millennium Ecosystem Assessment (MEA), 2005). Since ES are benefits, it can be measured using different valuation approaches such as social and behavioral methods like peoples' perception of ES (e.g., Farber et al., 2002; Kumar and Kumar, 2008). Recent works of Quevedo et al. (2020a,b) and Lukman et al. (2020) have shown perceptions of local communities on ES through their awareness and utilization behaviors, and how these perceptions can influence effective management of coastal resources. As stated by Ouko et al. (2018), perceptions of local communities on ES are very important to understand and better recognize their role in multi-governance of environments.

Likewise, perceptions of tourism are vital to understanding how different stakeholders (e.g., residents and government) recognize the impacts (positive or negative) of tourism development (Xu et al., 2016). Communities' perceptions are important for sustainable tourism development and management of ecosystems because they can facilitate better valuation of ES such as compliance with environmental management and policy directives and encouragement of pro-environmental attitudes (Asah et al., 2014). Also, how these perceptions are formed are valuable metrics for decision-makers (Eshliki and Kaboudi, 2012). Furthermore, understanding various perceptions of ES for urban and rural settings is becoming critical, given that understanding of place-based tourism activities is needed among urban and rural communities that have different environmental conditions (e.g., Secretariat of the Convention on Biological Diversity (SCBD), 2012; Uchiyama and Kohsaka, 2019). Proximity to tourism resources can also be a factor that influences perceptions of ES supplied by the resources (Uchiyama and Kohsaka, 2016). In this study, perception is understood as a subjective process, whereby comprehension of people in both urban and rural settings to a certain topic differs individually based on how they process information, the manner of interpretation, and their personal experiences (Ingold, 2000; Dyer et al., 2007; Quevedo et al., 2020a,b, 2021b,c).

Advances on theoretical studies of tourism impacts and the complexity of individuals' attitudes have pushed towards the integration of several approaches to understand residents' perceptions (Andereck and Nyaupane, 2011; Vargas-Sánchez et al., 2015; Eshliki and Kaboudi, 2012; Xu et al., 2016). Thus, studies on locals' perceptions of tourism usually include assessment of personal benefits (Hanafiah et al., 2013; Xu et al., 2016) and impacts on the community and environment (Andereck and Nyaupane, 2011; Eshliki and Kaboudi, 2012). Measuring perception of tourism benefits include direct (personal gains) and indirect (larger scale; e.g., community) benefits (Xu et al., 2016) while tourism impacts are often scaled based on three categories, sociocultural, economic, and environmental (Andereck et al., 2005). Since tourism development usually involves tradeoffs between economic benefits and cultural or environmental costs, residents downplay the negative effects based on the economic gains to maintain satisfaction within their community (Harrill, 2004; Dyer et al., 2007); people are likely to have a positive attitude towards tourism development when personal benefits outweigh the costs (Andereck et al., 2005).

1.4. Drivers of community perceptions

Recently, there is a shift in focus at the conceptual level leaning towards the "indirect drivers" in assessing biodiversity-related issues; although it relatively receives lesser attention compared to "direct drivers" or "pressures", which are highly discussed in the Driver-Pressure-State-Impact-response (DPSIR) frameworks (e.g., Kohsaka, 2010) or "direct/indirect drivers" in the Millennium Ecosystem Assessment frameworks (Millennium Ecosystem Assessment (MEA), 2005). These indirect factors such as demographic, economic, socio-political, scientific and technological, and cultural and religious, can heavily influence consumption patterns with subsequent environmental implications. Understanding these societal drivers is vital to sustainable ecosystem management (Millennium Ecosystem Assessment (MEA), 2005).

Since perceived ecosystem benefits are expressed by people based on their comprehension and interpretation, it has been a challenge in the scientific community to determine the factors that influence their perceptions. For instance, Quevedo et al. (2020a) have explored and showed that residents' socio-demographic characteristics and socio-political views can be correlated with their perceptions and utilization of blue carbon ES. Other investigations like the works of Asah et al. (2014), Zhang et al. (2006), and Lhoest et al. (2019), have also shown that demographic profiles of the residents can affect their perceptions of ecosystem benefits which in turn affect the condition of coastal resources.

The attitude of the people towards tourism development can be influenced by several factors such as residents' socio-demographic characteristics (McGehee and Andereck, 2004), community satisfaction (Ko and Stewart, 2002), level of engagement (Andereck et al., 2005), and geospatial factors (Raymond and Brown, 2007), among others. However, the results of these studies are inconclusive and sometimes case-to-case basis. Thus, exploring the factors and their associations with residents' perception of tourism should be done cautiously.

1.5. Research gaps, objectives and contributions

In Busuanga Island, Philippines, the coastal and marine tourism industry has been a major contributor to its economic growth, thus, tourism-related infrastructures are well developed over the past decade in the island (Okazaki, 2008; Tomeldan, 2009). Oftentimes, tourism developments such as reclamation and road widening projects threaten BCEs on the island, frequently unnoticed by the residents as certain portions are changes under water

or due to indifference. Recent household surveys conducted on the island by Quevedo et al. (2021c) have documented that anthropogenic activities like building infrastructures and pollution from domestic wastes threaten the BCEs. Similarly, key informant interviews conducted on the island also revealed how tourism-related activities pressure BCEs and other coastal ecosystems (Quevedo et al., 2021a). Although these activities can be linked as impacts of tourism industry, explicit investigations of the impacts, whether positive or negative, to BCEs are very limited, hence, more comprehensive analyses are needed. To address these gaps, this study will analyze communities' perceptions of sustainable tourism and BCE services by comparing household survey results from urban and rural communities. Specifically, this work aims to determine residents' perceptions of the impact of tourism at the personal and community levels, to examine whether socio-demographic profiles, ecological consciousness, awareness of programs for sustainable tourism, and ecological protection drive these perceptions, and to compare these results between urban and rural contexts.

Although the number of studies on ES and tourism perceptions is increasing, there is still a gap on how to effectively measure people's perceptions and determine the factors attributed to their perceptions. Through this study, the authors also aim to effectively strengthen the use of perceptions and other sociological factors in assessing tourism benefits and impacts and the protection and conservation of BCEs. Though the research queries used here were derived from existing studies (e.g., Xu et al., 2016; Liu and Li, 2018), the scale applied and identified perceptions determinants of this research can contribute to developing a perception measurement scale at multiple villages and in identifying possible indirect drivers of community perceptions. By identifying locals' perceptions, the insights of this study can support policy decision-makers in crafting a holistic approach to sustainable tourism development and BCE resource management attuned to both urban and rural contexts with different scales.

2. Research methods

2.1. Study area

This study is conducted in the municipalities of Busuanga and Coron in Busuanga Island in the northern part of Palawan province, Philippines (Fig. 1). The two municipalities have contrasting characteristics from socio-economic contexts, which provide us with a unique opportunity to gain insight for comparing perceptions in different urbanization degrees. Busuanga is a third-class municipality consisting of 14 coastal villages or barangays, the smallest administrative unit in the Philippines. The total land area of the town is around 53,051 ha with Cheey and Panlaitan as the largest (32%) and smallest (0.4%) barangay, respectively, in terms of land area coverage (Bautista et al., 2017). Busuanga has many small islands and islets which are mostly inhabited by the *Tagbanuas* (Indigenous People). In terms of land cover, Busuanga is mainly classified as brushlands and grasslands (60.4%) and secondary forest (32.5%) while agricultural and built-up areas are relatively small fractions comprising 4.2% and 1.4% of the total land area, respectively. Urban developments (built-up areas) are concentrated in the town's center, Barangay Salvacion (Fig. 1). The main economic activities in Busuanga come from fishing, forestry, and agriculture sectors (Bautista et al., 2017). Tourism development in the municipality is not yet prominent and on-going tourism planning is in the works (Municipal Agriculturist, personal communication, July 2019).

In contrast, Coron is a first-class municipality comprising of 7 urban, 11 rural, and 5 rural-island barangays (Abrenica et al., 2017). With a total land area of approximately 69,247 ha, the municipality is dominated by grasslands and forests accounting for 46.5% and 36.3% of the total land area, respectively. Identified built-up (urban) areas in the town are around 498.5 ha which is mainly comprised of residential, commercial, institutional, open spaces, and roads. Most tourism and other developments are situated in its 7 urban barangays (Poblacion I-VI, and Tagumpay) accounting for 323 ha of the built-up area in the 2010 land cover (Fig. 1). The municipality of Coron is a well-known tourist destination that gives visitors access to nearby famous destinations like Coron Island (Kobayashi, 2017). From its agricultural and fisheries-dominated economy, the town has evolved into a premier tourist destination in the country yielding high economic revenues (Abrenica et al., 2017). The growing tourism industry has opened opportunities for commercial or business establishments in the municipality.

In terms of blue carbon resources, the municipality of Busuanga has an estimated 2,249 ha of mangroves and 172 ha of sparse and dense seagrass beds. The top five barangays with high mangrove forest cover include Calauit (658 ha), Sagrada-Bogtong marine sanctuary (317 ha), Sto. Niño (292 ha), Old Busuanga (265 ha), and New Busuanga (168 ha). On the other hand, seagrass meadows which serve as feeding grounds of *Dugong dugong*, fishes, and other marine fauna can be found along the coastal waters of Barangay Conception, Sto. Niño, Quezon, and Cheey. Meanwhile, in Coron, the total mangrove area cover is around 2,691 ha and roughly a quarter of them (25.5%) can be found in Barangay Bintuan (Fig. 1). Although most of the mangrove forests are located in rural barangays, a few mangrove areas (265 ha) are seen along the coastal portions of urban barangays. Majority of the seagrass beds (~3,545 ha) are distributed in rural barangays, with a few (~85.48 ha) thriving in an urban village, Tagumpay. Despite the contrasting socio-economic drivers, both municipalities have high regard for their coastal and marine resources. This is reflected in various active stakeholders present in the municipalities that are essential in achieving a better integrated coastal management system. For instance, the networks of social capitals such as presence of people's organizations (POs) and non-government organizations (NGOs) encourages the active participation of community members in management-related activities (Quevedo et al., 2021c) while local government institutions (e.g., Municipal Agriculture Office) oversee formulation and implementation of coastal and marine management ordinances or policies (Quevedo et al., 2021a).

2.2. Sampling and survey procedures

Before the conduct of the survey, field consultations in the relevant local government offices were done to confirm the pre-selected barangays. The surveys were carried over at select barangays with the following criteria (Quevedo et al., 2020a,b): presence of mangrove and seagrass ecosystems, proximity of coastal communities to BCEs, and accessibility of the village. Given the set of conditions and time constraints, the household surveys were performed in 5 barangays (Salvacion, Bogtong, Sagrada, Concepcion, and Sto. Niño) in Busuanga and 3 villages (Poblacion V, Tagumpay, and Bintuan) in Coron (Fig. 1. Although Barangay Bintuan is a rural barangay, the authors noted that this village has tourism benefits and impacts (e.g., port, boardwalk), thus residents' perceptions will show similarities in perceptions from urban residents.

The sample size in each municipality was computed based on the 2015 coastal population size at a 95% confidence level with a 10% sampling error. A total of 98 respondents in Busuanga and 96 in Coron were surveyed from 19th to 25th of July 2019. Utilizing the same methodologies of Quevedo et al. (2020a,b), each respondent was selected randomly; surveying one household in every 5 households where possible. Stating the purpose

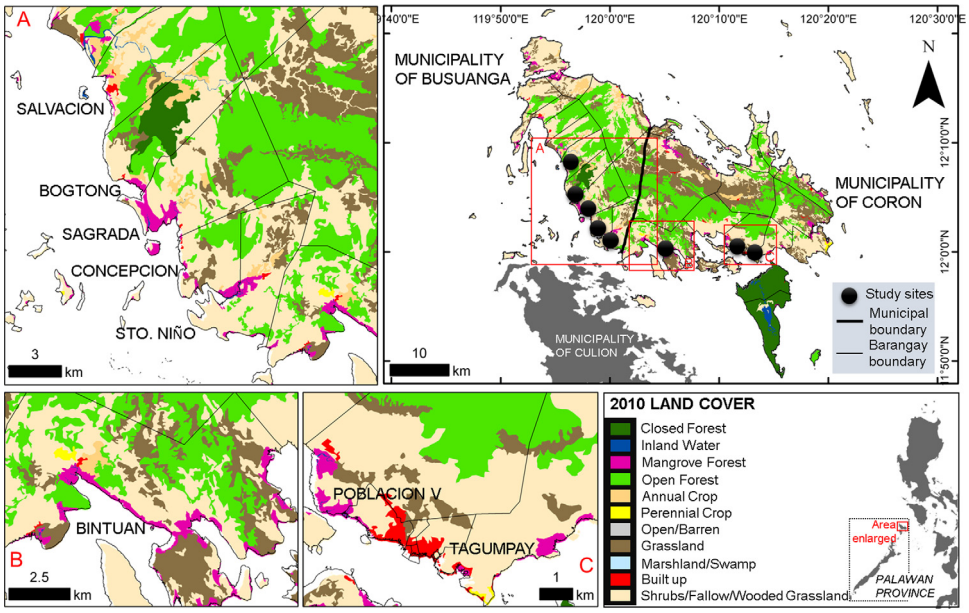

Fig. 1. Location and land cover map of the study sites; Municipalities of Busuanga (A) and Coron (B, C).

of the survey and getting the permission of each respondent were taken into account carefully. Moreover, field enumerators who are associated with the respective local government units (LGUs) assisted the conduct of surveys.

A total of 194 individuals were surveyed in the coastal villages of the two municipalities in Palawan province. Supplementary Table 1 shows the summary of the socio-demographic profile of the respondents.

2.3. Survey questionnaire

The survey questionnaire which was translated to Filipino or Tagalog, the language of communication, has six (6) sections; socio-demographic profile, awareness of blue carbon ES, perceived personal benefits, perceived tourism impacts, perceived environmental change, and perceived potential measures of sustainable tourism (Appendix A). The socio-demographic data and blue carbon ES awareness sections were modified from the studies of Quevedo et al. (2020a,b). A five-point Likert scale was used to determine the level of awareness of the benefits derived from mangroves and seagrasses, from 1 (not aware) to 5 (extremely aware).

The perceived personal benefits were assessed using a set of qualitative statements with a 5-point Likert scale of 1 (not beneficial) to 5 (extremely beneficial). The terminologies used in the study of Xu et al. (2016) were adopted in this research to differentiate direct (personal enhancement) from indirect (community sentience) benefits. General statements like "Alternative source of livelihood", "Source of income", "Business investments", and "Environmental conservations" were used to determine how beneficial tourism is, for them and their municipality.

The community impacts scale used in this study is comprised of 17 items representing socio-cultural, economic, and environmental dimensions. The statements are modified from the studies of Greiner (2010), Xu et al. (2016), and Liu and Li (2018) which are to be interpreted by the respondents as either positive or negative impact of tourism industry. The first dimension (6 items) includes items like "Variety of retail options", "Interaction with tourists" while the second dimension (5 items) includes for example, "Government investments in the town" and "Availability of jobs". The last dimension is comprised of 6 items (i.e. "Domestic waste pollution", and "Sewage system". Residents' perceived impacts were rated following the works of Greiner (2010); from −2 (highly negative) to 2 (highly positive), with 0 as the neutral or no observed impact. Moreover, besides the impact of tourism on the environment (in general), observed changes explicitly directed to BCE were examined. Specific perceived changes to habitat cover (general conditions), conservation efforts, accessibility, and seafood stocks availability of mangroves and seagrasses were rated using a 5-point Likert scale from 1 (very much degrading) to 5 (very much improving).

The last section of the questionnaire covers residents' opinions on potential measures (12 items) for promoting sustainable tourism in their municipalities. A 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree) was utilized to rate these suggested sustainable strategies (e.g., "Strengthening environmental regulations", "Strict implementation of local plans and policies", and "Cooperation with non-government organizations (NGO) and private sectors for environmental conservation").

2.4. Data analyses

The data analyses in this study include descriptive statistics (i.e. frequencies, percentages, and means), reliability tests, comparison tests, correlations, and multivariate regressions. Descriptive statistics were used to show the respondents' socio-demographic profiles, perceptions of tourism, awareness of blue carbon ES, observed effects of tourism to BCE, and perceived measures of sustainable tourism. Cronbach's alpha (α) is a common statistical tool to show that tests and scales have been constructed fit for purpose (Taber, 2018). In this study, Cronbach's alphas were calculated to test the internal reliability of items comprising each dimension of personal benefits (personal enhancement and community sentience), community impacts (socio-cultural, economic, and environmental), and perceived sustainable tourism measures, respectively. The grand means (M) of direct and indirect benefits and each impact dimension were calculated, and then overall mean scores of personal benefits and observed impacts were computed. Following the methods of Xu et al. (2016) to standardize measurements, the authors reverse coded the items "Prices of goods and services in the town", "Job competition between locals and tourists", "Fish, shells

and other seafood stocks availability", "Domestic waste pollution", "Sewage system", and "Availability of freshwater" before calculating dimension and overall means.

The Mann–Whitney U test, a nonparametric test (MacFarland and Yates, 2016) was used to evaluate if there are significant differences in how respondents of Busuanga and Coron perceived tourism benefits and impacts and sustainability measures. The correlations among variables were done using a nonparametric test, Spearman's rank correlation coefficient (ρ). Quevedo et al. (2020a) have used this statistical tool to evaluate the relationships of being aware of the benefits with the frequency of accessing the BCE. However, in this study, Spearman's rho is utilized to analyze associations between the level of awareness of blue carbon ES and the perceived effect of tourism on these habitats.

Multivariate regressions were utilized to evaluate the influence of respondents' socio-demographic characteristics with their perceived personal benefits and community impacts brought about by the tourism industry. Following the same approach of Xu et al. (2016), three regression paths were obtained. First, residents' social demographics (independent variables) were regressed to locals' perceived direct (personal enhancement) and indirect (community sentience) benefits. The second path includes regressing the independent variables to overall tourism impact as well as its three dimensions; socio-cultural, economic, and environmental. In the last path, residents' perceived benefits as the independent variables were regressed to their observed socio-cultural, economic, and environmental impacts of tourism industry.

3. Results

The following sections present the respondents' socio-demographic characteristics 3.1 , how they perceived the benefits and impacts of tourism (3.2), and the factors that could be associated with their observations 3.3. Moreover, perceptions of BCE and its services are evaluated specifically through locals' awareness (3.4), followed by the observed effect of tourism on these ecosystems (3.5). Lastly, locals' perceived measures to promote sustainable tourism are presented in Section 3.6.

3.1. Socio-demographic profile of the respondents

Supplementary Table 1 shows the socio-demographic profile of the respondents. Busuanga town has almost the same distribution of respondents in terms of gender (51.0% male and 49.0% female) with a mean age of 44 years old, while most of the respondents in Coron are female (65.6%) with a mean age of 40 years old. The majority of the interviewees in Busuanga (75.5%) and Coron (66.7%) have been living in the neighborhood for more than 21 years with a few percentages (Busuanga — 11.2%; Coron — 12.5%) living for about 5 to 10 years. Most respondents (51.0%) of Busuanga have finished primary school and 30.6% completed secondary school. The same trend was observed in Coron, where nearly half (46.9%) of the respondents have completed the primary school and 34.4% finished high-school. A few numbers of respondents do not have formal education, comprising 11.2% and 13.5% of the sample size in Busuanga and Coron, respectively.

Salaried individuals (daily, weekly, or monthly earners) covering skilled workers, government employees, and part-time workers comprised 40.8% and 43.8% of the respondents in Busuanga and Coron, respectively. Other occupations recorded are fishing and farming. Stay-at-home wives and husbands account for 30.6% and 36.5% of the respondents in Busuanga and Coron, respectively. The daily income of the two municipalities varies from below a hundred (1.0% to 6.3%) to more than 500 pesos (4.1% to 8.3%). Around 20.4% of Busuanga respondents earn 201 pesos to 300 pesos per day while 20.8% of respondents in Coron have a daily income ranging from 101 pesos to 200 pesos. The unemployed group accounts for 30.6% of the respondents in Busuanga and 36.5% in Coron.

3.2. Perceived personal benefits and impacts of tourism industry

The Cronbach's tests indicated high internal reliability among the perceived direct (personal enhancement, $\alpha = 0.86$) and indirect (community sentience, $\alpha = 0.88$) benefits obtained from the tourism industry (Table 1). Overall, the respondents of Busuanga recognized tourism to be slightly beneficial ($M = 2.99$). They perceived that personal enhancements are slightly beneficial ($M = 2.82$); from offering as an alternative source of livelihood ($M = 2.86$), source of income ($M = 2.88$), and from accessing tourism facilities ($M = 2.72$). However, they agree that tourism is moderately beneficial ($M = 3.10$) for their community. Respondents perceived that tourism is moderately beneficial to livelihood availability ($M = 3.10$), environmental conservations ($M = 3.32$), and new cultural practices ($M = 3.14$) in their municipality. Income-generating ($M = 2.96$) and business investment ($M = 2.97$) opportunities are perceived to be slightly benefited from tourism industry as well.

In contrast, overall perceived personal benefits of tourism in Coron is moderately beneficial ($M = 3.09$) (Table 1). Based on the two dimensions, perceived benefits for community sentience is perceived moderately ($M = 3.19$; $\alpha = 0.97$) than personal enhancements ($M = 2.92$; $\alpha = 0.96$). Income generation ($M = 3.16$), livelihood options ($M = 3.21$), business investments ($M = 3.15$), environmental conservations ($M = 3.32$), and new cultural practices ($M = 3.09$) are all perceived to be moderately beneficial. In terms of direct benefits, Coron's residents said that tourism has slight benefits to their income source ($M = 2.87$), livelihood source ($M = 2.97$), and access to tourism facilities ($M = 2.82$).

Overall, in Busuanga, respondents perceived tourism to have less impact ($M = 0.27$) in their community (Table 2a). Examined by dimensions, socio-cultural impacts ($M = 0.66$, $\alpha = 0.82$) of tourism in Busuanga are perceived higher than economic ($M = 0.20$, $\alpha = 0.77$) and environmental ($M = -0.05$, $\alpha = 0.91$) impacts. Within the socio-cultural dimension, 40.8% to 65.3% of the respondents said that tourism is likely to have positive impact to community unitedness $M = 0.78$), interaction with visitors ($M = 0.65$), recreational ($M = 0.68$) and retail ($M = 0.67$) activities, and facilities ($M = 0.55$) and food availability ($M = 0.65$). In terms of economic impacts, they perceived a likely positive effect to availability of jobs ($M = 0.65$) and increase in government investments ($M = 0.50$) while negative impacts on commodities' prices ($M = -0.02$) and job competitions between locals and visitors ($M = -0.45$). Moreover, perceived tourism impact to environmental dimensions vary; for instance, domestic wastes ($M = -0.10$) and sewage systems ($M = -0.28$) are negatively affected compared to condition of beaches ($M = 0.52$). Coastal resource availability is perceived to be negatively affected ($M = -0.20$) as well as freshwater availability ($M = -0.52$).

Tourism industry in Coron has an overall perceived mean impact of 0.41, nearly positive effect on the community (Table 2b). It is slightly higher to the overall perceived impact of tourism in Busuanga. Majority of the respondents (59.4% to 81.3%) have positive perceptions on the socio-cultural impacts of tourism ($M = 0.93$, $\alpha = 0.95$) such as variety of retail options ($M = 0.89$) and recreational activities ($M = 1.11$). Examining the economic impacts ($M = 0.27$, $\alpha = 0.87$), 64.6% to 69.8% of the residents have positively rated the effect of tourism to availability of jobs ($M = 1.0$) and government investments ($M = 0.97$) while prices

Table 1
Respondents' perceived personal benefits from tourism industry.

	Personal benefits	Not beneficial	Slightly beneficial	Moderately beneficial	Very beneficial	Extremely beneficial	Mean
Busuaga ($n = 98$)	Personal enhancement - direct benefits ($\alpha = .86$)						2.82
	Alternative source livelihood	19.4%	18.4%	30.6%	20.4%	11.2%	2.86
	Source of income	23.5%	11.2%	29.6%	25.5%	10.2%	2.88
	Access to tourism facilities	22.4%	14.3%	37.8%	19.4%	6.1%	2.72
	Community sentience - indirect benefits ($\alpha = .88$)						3.10
	Income generating	13.3%	19.4%	31.6%	29.6%	6.1%	2.96
	Livelihood options	10.2%	17.3%	31.6%	33.7%	7.1%	3.10
	Business investments	10.2%	16.3%	46.9%	19.4%	7.1%	2.97
	Environmental conservation	5.1%	10.2%	42.9%	31.6%	10.2%	3.32
	Exposure to new culture and practices	8.2%	11.2%	45.9%	27.6%	7.1%	3.14
	Overall perceived personal benefits (mean)						
Coron (n = 96)	Personal enhancement - direct benefits ($\alpha = .96$)						2.92
	Alternative source livelihood	26.0%	7.3%	24.0%	29.2%	13.5%	2.97
	Source of income	25.0%	7.3%	25.0%	31.3%	11.5%	2.87
	Access to tourism facilities	27.1%	8.3%	26.0%	32.3%	6.3%	2.82
	Community sentience - indirect benefits ($\alpha = .97$)						3.19
	Income generating	27.1%	4.2%	15.6%	32.3%	20.83%	3.16
	Livelihood options	21.9%	9.4%	15.6%	32.3%	20.83%	3.21
	Business investments	25.0%	8.3%	14.6%	31.3%	20.83%	3.15
	Environmental conservation	20.8%	7.3%	15.6%	31.3%	25.0%	3.32
	Exposure to new culture and practices	18.8%	10.4%	28.1%	28.1%	14.6%	3.09
	Overall perceived personal benefits (mean)						3.09

Measured on a 5-point Likert scale ranging from "Not beneficial (1) to "Extremely beneficial" (5).

of goods and services in their community and job competition are somewhat negatively affected ($M = -0.24$ and $M = -0.91$, respectively). In terms of environmental impacts ($M = 0.00$, $\alpha = 0.93$), 60.4% to 86.5% of the respondents observed that tourism has positive effect on their beaches ($M = 0.78$) and condition of coral reefs and associated ecosystems ($M = 0.59$). However, they perceived that domestic wastes, sewage systems, seafood and freshwater availability are likely to be negatively affected by tourism activities ($M = -0.15$, $M = -0.34$, $M = -0.36$, and $M = -0.50$, respectively).

Moreover, the results of the Mann–Whitney U test show some significant differences in perceived impacts between the two municipalities (Fig. 2). In socio-cultural dimensions, the perceived effect of tourism on the variety of retail options and food selections in shops and restaurants is statistically higher in Coron ($M = 0.89$, $M = 0.97$) than in Busuanga ($M = 0.67$, $M = 0.65$, $p < 0.05$). Increase in recreational facilities and amenities and activities are also perceived positively higher in Coron ($M = 0.99$, $M = 1.11$) than Busuanga ($M = 0.55$, $M = 0.68$, $p < 0.05$). There are no significant differences in the observed impact of community unitedness and interaction with tourists between the two towns. Examining the economic impacts between the two municipalities, significant differences are recorded on their perceptions on government and business investments and available jobs for locals and tourists (Busuanga, $M = 0.50$, $M = 0.30$, $M = 0.65$, $M = -0.45$; Coron, $M = 0.97$, $M = 0.64$, $M = 1.00$, $M = -0.91$, $p < 0.05$) while no significant difference in retail prices of goods and services. Interestingly, the Mann–Whitney U test did not show any statistical differences in tourism impact on environmental dimensions.

3.3. Factors associated with respondents' perceptions of tourism industry

The socio-demographic characteristics of the respondents were regressed on the overall perceived personal benefits and its two dimensions, personal enhancement, and community sentience to examine the associations of these variables (Supplementary Table 2). The multiple regressions did not show significant results in Busuanga, however, looking at the β coefficients, the higher the education and the longer people lived in the neighborhood, the more direct tourism benefits they can see ($\beta = 0.199$; $\beta = 0.252$, respectively). In contrast, locals who have lived longer in Coron perceived lesser personal gains from tourism ($\beta = -0.167$). Significant results were obtained when respondents' demographics were regressed with their overall perceived personal benefits ($R^2 = 0.069$, $p < 0.05$) and its two dimensions, personal enhancement ($R^2 = 0.080$, $p < 0.05$) and community sentience ($R^2 = 0.053$, $p < 0.05$).

Multivariate regressions also showed that respondents' demographic characteristics can influence their perceptions of tourism impacts (Supplementary Table 3). For instance, respondents' views of socio-cultural impacts in Busuanga can be based on their demographic attributes ($R^2 = 0.069$, $p < 0.05$). Older (younger) residents will have higher (lower) comprehension of tourism impacts on social and cultural aspects ($\beta = 0.329$). Locals with low educational attainment recognized less negative environmental impacts whereas those who achieved higher education observed more effects ($\beta = -0.248$). Unlike its neighboring town, demographics of Coron showed significant correlations with overall perceived impacts ($R^2 = 0.086$, $p < 0.05$), including its socio-cultural ($R^2 = 0.115$, $p < 0.01$), economic ($R^2 = 0.082$, $p < 0.05$), and environmental ($R^2 = 0.068$, $p < 0.05$) scopes. Looking at the

Table 2a
Respondents' perceived impacts of tourism in the municipality of Busuanga.

Perceived impacts ($n = 98$)	Highly negative	Negative	No impact	Positive	Highly positive	Mean[a]
Socio-cultural impact ($\alpha = 0.82$)						0.66
Variety of retail options	1.0%	13.3%	17.3%	54.1%	14.3%	0.67
More food options in shops and restaurants	3.1%	10.2%	13.3%	65.3%	8.2%	0.65
Recreational facilities and amenities in the town	6.1%	14.3%	11.2%	55.1%	13.3%	0.55
Community strength and unitedness	2.0%	12.2%	18.4%	40.8%	26.5%	0.78
Interaction with tourists	3.1%	18.4%	10.2%	46.9%	21.4%	0.65
More activity options to do in the town	5.1%	12.2%	10.2%	54.1%	18.4%	0.68
Economic impact ($\alpha = 0.77$)						0.20[b]
Government investments in the town	6.1%	14.3%	17.3%	48.0%	14.3%	0.50
Availability of jobs	7.1%	8.2%	15.3%	51.0%	18.4%	0.65
Prices of goods and services in the town	8.2%	39.8%	14.3%	21.4%	16.3%	−0.02
Job competition between locals and tourists	10.2%	50.0%	21.4%	11.2%	7.1%	−0.45
More businesses can open	4.1%	23.5%	19.4%	44.9%	8.2%	0.30
Environmental impact ($\alpha = 0.91$)						−0.05[c]
Fish, shells, and other seafood stocks availability	11.2%	43.9%	8.2%	27.6%	9.2%	−0.20
Domestic waste pollution	7.1%	42.9%	16.3%	20.4%	13.3%	−0.10
Sewage system	6.1%	48.0%	20.4%	18.4%	7.1%	−0.28
Condition of beaches	6.1%	14.3%	14.3%	52.0%	13.3%	0.52
Condition of coral reefs and other ecosystems	8.2%	16.3%	23.5%	40.8%	11.2%	0.31
Availability of fresh water	16.3%	48.0%	12.2%	18.4%	5.1%	−0.52
Overall perceived impacts (mean)						0.27

[a]Measured on a 5-point Likert scale ranging from "Highly negative (−2) to "Highly positive" (2).
[b]The dimensional mean for Economic impact is calculated after reversing means for "prices of goods and services in the town" and "job competition between locals and tourists".
[c]The dimensional mean for Environmental impact is calculated after reversing means for "fish, shells, and other seafood stocks availability", "domestic waste pollution", "sewage system", and "availability of freshwater".

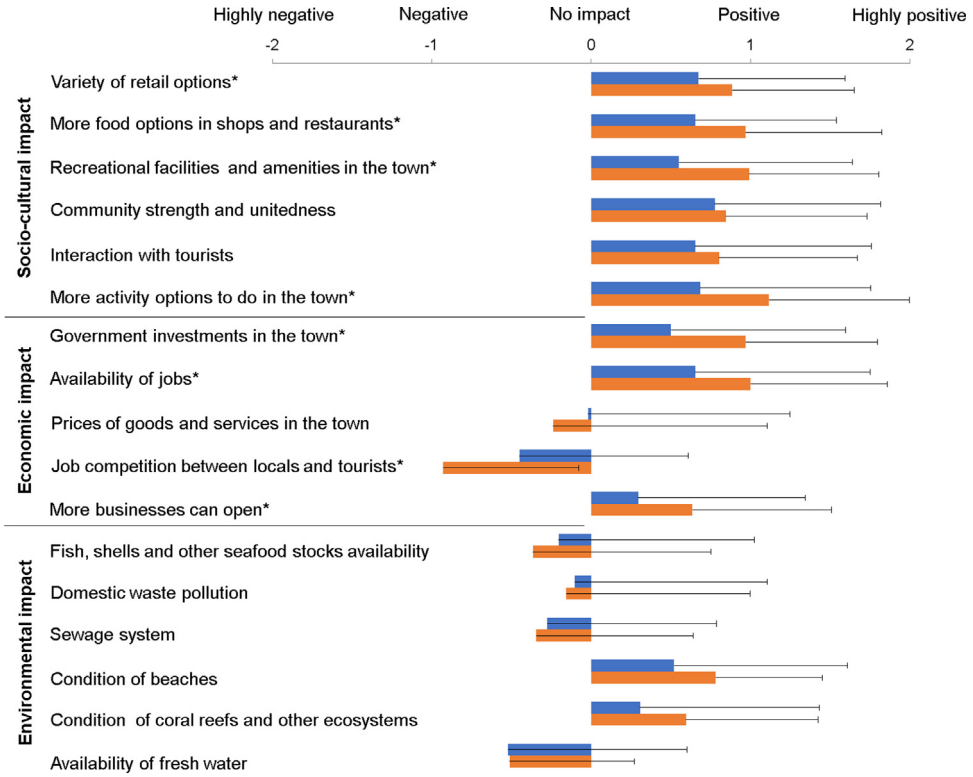

Fig. 2. Comparison of means of perceived impact of tourism between the municipalities of Busuanga ($n = 98$, blue bars) and Coron ($n = 96$, orange bars) using Mann–Whitney U test. Impacts with * indicates that difference of means is statistically significant at $p < 0.05$. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

Table 2b
Respondents' perceived impacts of tourism in the municipality of Coron.

Perceived impacts ($n = 96$)	Highly negative	Negative	No impact	Positive	Highly positive	Mean[a]
Socio-cultural impact ($\alpha = 0.95$)						0.93
Variety of retail options	3.1%	5.2%	1.0%	81.3%	9.4%	0.89
More food options in shops and restaurants	3.1%	5.2%	3.1%	68.8%	19.8%	0.97
Recreational facilities and amenities in the town	3.1%	4.2%	2.1%	71.9%	18.8%	0.99
Community strength and unitedness	3.1%	6.3%	10.4%	63.5%	16.7%	0.84
Interaction with tourists	3.1%	5.2%	14.6%	62.5%	14.6%	0.80
More activity options to do in the town	3.1%	4.2%	2.1%	59.4%	31.3%	1.11
Economic impact ($\alpha = 0.87$)						0.29[b]
Government investments in the town	3.1%	4.2%	4.2%	69.8%	18.8%	0.97
Availability of jobs	3.1%	4.2%	5.2%	64.6%	22.9%	1.00
Prices of goods and services in the town	14.6%	46.9%	0.0%	25.0%	13.5%	−0.23
Job competition between locals and tourists	17.7%	68.8%	5.2%	5.2%	3.1%	−0.91
More businesses can open	2.1%	10.4%	18.8%	59.4%	9.4%	0.64
Environmental impact ($\alpha = 0.93$)						0.00[c]
Fish, shells and other seafood stocks availability	7.3%	56.3%	10.4%	17.7%	8.3%	−0.36
Domestic waste pollution	2.1%	57.3%	6.3%	22.9%	11.5%	−0.15
Sewage system	0.0%	63.5%	14.6%	14.6%	7.3%	−0.34
Condition of beaches	2.1%	6.3%	4.2%	86.5%	1.0%	0.78
Condition of coral reefs and other ecosystems	2.1%	9.4%	21.9%	60.4%	6.3%	0.59
Availability of fresh water	1.0%	63.5%	22.9%	10.4%	2.1%	−0.50
Overall perceived impacts (mean)						0.41

[a]Measured on a 5-point Likert scale ranging from "Highly negative (−2) to "Highly positive" (2).
[b]The dimensional mean for Economic impact is calculated after reversing means for "prices of goods and services in the town" and "job competition between locals and tourists".
[c]The dimensional mean for Environmental impact is calculated after reversing means for "fish, shells, and other seafood stocks availability", "domestic waste pollution", "sewage system", and "availability of freshwater".

individual variables, respondents' education is negatively related to how they perceived the overall impact of tourism ($\beta = -0.194$) as well its environmental dimension ($\beta = -0.252$); suggesting as educational attainment increases, the more negative impacts can be recognized.

Interestingly, respondents' perceptions of tourism benefits did not strongly influence their opinions on tourism impacts (Supplementary Table 4). Significant results were only obtained in Coron where tourism benefits were regressed with economic ($R^2 = 0.138$, $p < 0.01$) and environmental ($R^2 = 0.255$, $p < 0.001$) impacts. Examining the β coefficients of Busuanga showed a positive relationship of "Source of income" under direct benefits with economic impacts ($\beta = 0.330$) whereas indirect benefit "Environmental conservation" displayed a negative relationship ($\beta = -0.296$). These associations suggest that as more income will be generated from tourism activities, the higher their perceptions of the economic value of tourism. In Coron, "Business investments" under indirect benefits is positively correlated with socio-cultural impacts ($\beta = 0.663$), indicating that more investments will come in as socio-cultural aspects of tourism grow.

3.4. Respondents' awareness of blue carbon ecosystem services

Quevedo et al. (2021c) reported that 69.4% to 76.5% of the respondents in Busuanga have high awareness of the ES derived from mangroves ranging from "moderate" to "extremely aware" (Fig. 3). Provisioning services received high recognition comprising 76.5% of the respondents where 27.6% are "very aware". Regulating services such as coastal protection and carbon sequestration as well the cultural services are well acknowledged by the respondents; 30.6%, 35.7%, 29.6%, respectively are "very aware". The same trends were observed in Coron where 53.1% to 75.0% of the respondents have high awareness of the benefits they can get from mangroves (Fig. 3). Among the benefits, mangrove areas as a source of fish, shells, crabs, and others are well recognized by 75.0% of the respondents of which 37.5% are "very aware". In contrast, blue carbon services are the least recognized benefits accounting 53.1% of the sample size while the other 46.9% is distributed to 10.4% "slightly aware" and 36.5% "not aware". Tourism activities in mangroves such as paddling have gained more attention with 69.8% of the respondents are "moderate" to "extremely aware".

Awareness of seagrass ES depends on the type of service. For example, fishing and gleaning in seagrass beds are known activities in the island with 59.2% and 76.0% of the respondents are "moderately" to "extremely aware" in Busuanga and Coron, respectively. Seagrass ecosystems as coastal protectors are not well recognized; 12.2% to 45.9% of the sample size are "slightly aware" to "not aware" in Busuanga and 17.7% to 33.3% in Coron. Another regulating service that they are not so familiar with is the capacity of seagrasses to sequester and store carbon. A little over half (54.1%) of the sample size in Busuanga are aware while 45.9% are "slightly aware" to "not aware" (Quevedo et al., 2021c), whereas almost half (49.0%) of Coron's respondents do not know this function. For cultural benefits, 60.2% to 65.6% of the respondents of the two municipalities are aware of these.

3.5. Respondents' perceived effect of tourism to blue carbon ecosystems

The general observation of the respondents in both sites reflects an overall improving state of BCEs (Fig. 4). Mangrove cover

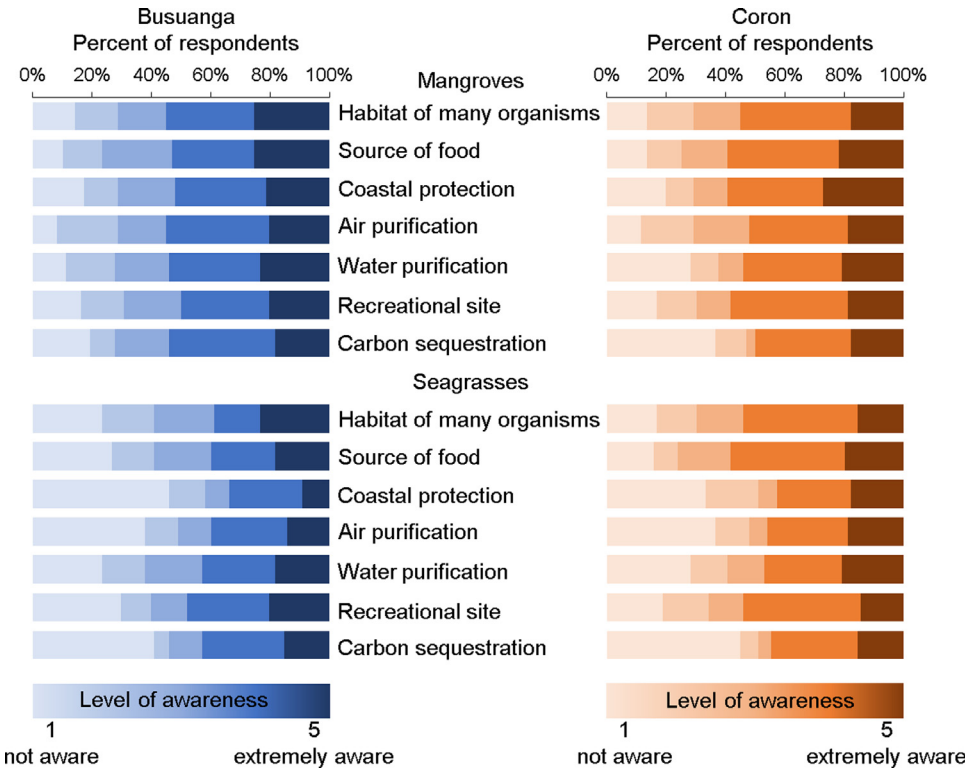

Fig. 3. Respondents' level of awareness of blue carbon ecosystem services.

in Busuanga is perceived to be improving ($M = 3.87$), a little higher than what is recorded in Coron ($M = 3.41$). Tourism activities in both towns are observed to not affect resource' accessibility (Busuanga, $M = 3.19$; Coron, $M = 3.32$). Also, the availability of fishes and other seafoods that are sourced out in mangrove areas are not affected (Busuanga, $M = 3.48$; Coron, $M = 3.33$) suggesting no shortage of supplies. Conservation efforts influenced by the tourism industry are perceived to be improving in both towns as well; Busuanga, $M = 3.69$; Coron, $M = 3.56$.

The same trends are seen for the perceived effect of tourism activities on seagrass ecosystems (Fig. 4). Busuanga's respondents are cognizant that the overall condition of their seagrasses is almost improving ($M = 3.70$) while tourism is perceived to have no effect on seagrasses in Coron($M = 3.39$). Accessibility and food source availability in seagrasses are not affected by tourism as well for both towns (Busuanga, $M = 3.19$, $M = 3.40$; Coron, $M = 3.32$, $M = 3.33$). Lastly, the respondents recognized that activities promoting the protection and conservation of seagrasses are somewhat affected ("improving") by tourism (Busuanga, $M = 3.49$; Coron, $M = 3.50$).

The municipality of Busuanga showed significant results when respondents' perceived effects of tourism were correlated with their awareness of blue carbon ES, indicating a mediating effect of the level of cognizance on respondents' observed effects (Table 3). Negative relationships were obtained between mangroves' awareness and effect of tourism to its cover, conservation efforts, accessibility, and food source availability. For instance, perception on mangroves' general cover are associated with their awareness on "habitat of many organisms" ($\rho = -0.221$), as a "food source" ($\rho = -0.268$), "coastal protection" ($\rho = -0.252$), and as "recreational site" ($\rho = -0.216$). However, these correlations are in opposing directions suggesting that with high (low) awareness of the mangrove benefits, respondents will less (more) likely to perceive the impacts of tourism to mangroves. In contrast, the associations acquired when correlating seagrass ES awareness with perceived environmental changes were all positive. Perceived general condition of seagrasses, for instance, is influenced by their knowledge that these ecosystems are home to various fauna ($\rho = 0.760$), great source of food ($\rho = 1.000$), coastal protectors ($\rho = 0.641$), help purify air ($\rho = 0.445$) and water ($\rho = 0.519$), sequester carbon ($\rho = 0.416$), and site for recreational activities ($\rho = 0.525$). These relationships may reflect that through their awareness (high or low) of seagrass benefits, they can effectively recognize the changes (improving or degrading) brought by tourism to seagrasses.

Spearman's rho correlation analyses did not show the same trends for the perceptions in Coron town; only a few associations were recorded (Table 3). Based on the perceived effect of tourism to mangroves' cover, residents' responses are positively influenced by their knowledge on regulating services of mangroves such as coastal protection ($\rho = 0.172$) air ($\rho = 0.229$) and water ($\rho = 0.370$) purifications and carbon sequestration ($\rho = 0.258$). Awareness of regulatory benefits is also positively correlated with perceived changes to "food source availability". The same results were reflected for seagrass ecosystems, where awareness of regulatory and cultural functions is positively attributed with their observed environmental changes to its general condition; "coastal protection" ($\rho = 0.273$), "air" ($\rho = 0.200$) and "water" ($\rho = 0.261$) purifications, "carbon sequestration" ($\rho = 0.241$), and as "recreational site" ($\rho = 0.180$). Conversely, negative associations were obtained between mangrove benefits awareness and resources' accessibility; habitat ($\rho = -0.222$), food source ($\rho = -0.207$), coastal protector ($\rho = -0.298$), and as recreational site ($\rho = -0.172$). Under seagrasses, accessibility is also inversely correlated with respondents' awareness of ES like "habitat for organisms" ($\rho = -0.310$) and "food source" ($\rho = -0.263$). These inverse relationships indicate that the more they recognized these ES, the more they can acknowledge that tourism can hinder accessibility.

Overall awareness of ES was correlated with perceived tourism benefits and impacts (Table 4). Negative correlations were obtained in both municipalities between overall awareness and

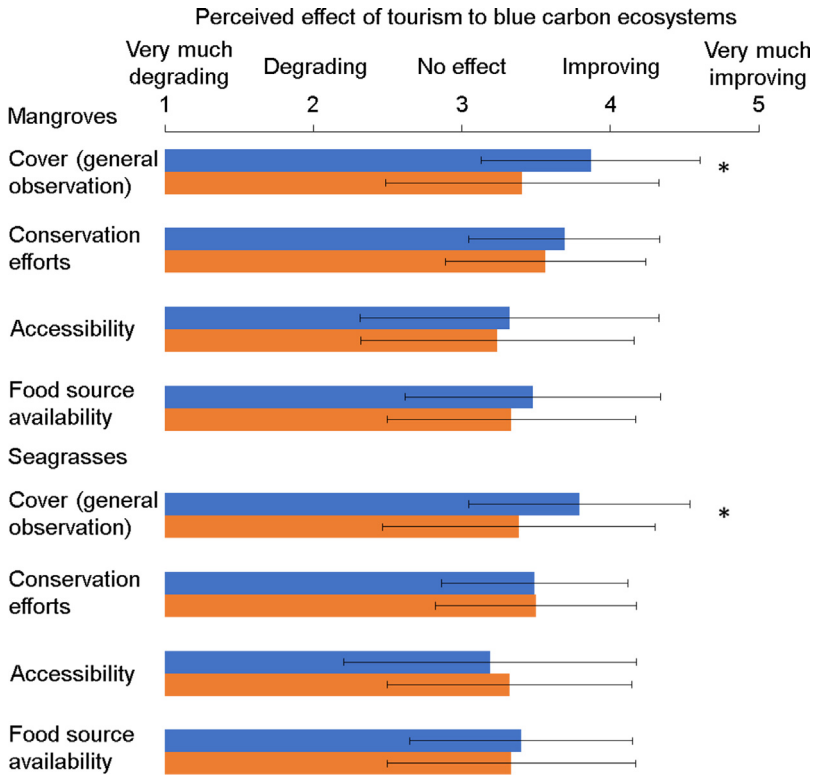

Fig. 4. Perceived environmental change (weighted average and standard deviation) brought by tourism to blue carbon ecosystems of Busuanga (blue bars) and Coron (orange bars). Bars with * indicates that the difference of means is statistically significant at $p < 0.05$ using Mann–Whitney U test (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

Table 3
Correlation analysis of respondents' awareness of blue carbon ES and perceived environmental changes.

Awareness of ecosystem services	Mangrove ecosystems				Seagrass ecosystems			
	Cover (general observation)	Conservation efforts	Accessibility	Food stock availability	Cover (general observation)	Conservation efforts	Accessibility	Food stock availability
Busuanga								
Habitat of many organisms	−0.221[b]	−0.170[a]	−0.420[c]	−0.368[c]	0.760[c]	0.612[c]	0.545[c]	0.638[c]
Food source	−0.268[c]	−0.179[a]	−0.480[c]	−0.353[c]	1.000[c]	0.641[c]	0.445[c]	0.519[c]
Coastal protection	−0.252[c]	−0.269[c]	−0.449[c]	−0.399[c]	0.641[c]	1.000[c]	0.608[c]	0.671[c]
Air purification		−0.212[b]	−0.229[b]		0.445[c]	0.608[c]	1.000[c]	0.712[c]
Water purification		−0.304[c]	−0.309[c]		0.519[c]	0.671[c]	0.712[c]	1.000[c]
Recreational site	−0.216[b]	−0.153	−0.311[c]	−0.285[b]	0.525[c]	0.489[c]	0.556[c]	0.649[c]
Carbon sequestration		−0.227[b]	−0.165[a]		0.416[c]	0.565[c]	0.689[c]	0.786[c]
Coron								
Habitat of many organisms			−0.222[b]			−0.182[a]	−0.310[c]	
Food source			−0.207[b]			−0.198[b]	−0.263[c]	
Coastal protection	0.172[a]		−0.298[c]		0.273[c]			
Air purification	0.229[b]			0.191[a]	0.200[b]			
Water purification	0.370[c]	0.190[a]		0.376[c]	0.261[c]			
Recreational site			−0.172[a]		0.180[a]			
Carbon sequestration	0.258[c]			0.282[c]	0.241[b]			0.213[b]

[a] $p < 0.10$.
[b] $p < 0.05$.
[c] $p < 0.01$; only statistically significant results are shown.

perceived tourism benefits; $\rho = -0.177$ (mangroves awareness), $\rho = -0.220$, $\rho = -0.181$ (seagrasses awareness) in Busuanga and $\rho = -0.198$ (mangroves awareness) and $\rho = -0.261$ (seagrasses awareness) in Coron whereas, no significant correlations were recorded between overall ES awareness and perceived tourism impacts

3.6. Respondents' perceived general measures for sustainable tourism

The respondents were asked whether they agree or not on the possible measures to promote sustainable tourism in their respective towns (Busuanga, $\alpha = 0.87$; Coron, $\alpha = 0.95$). Overall, the residents agree with varying degrees of the suggested

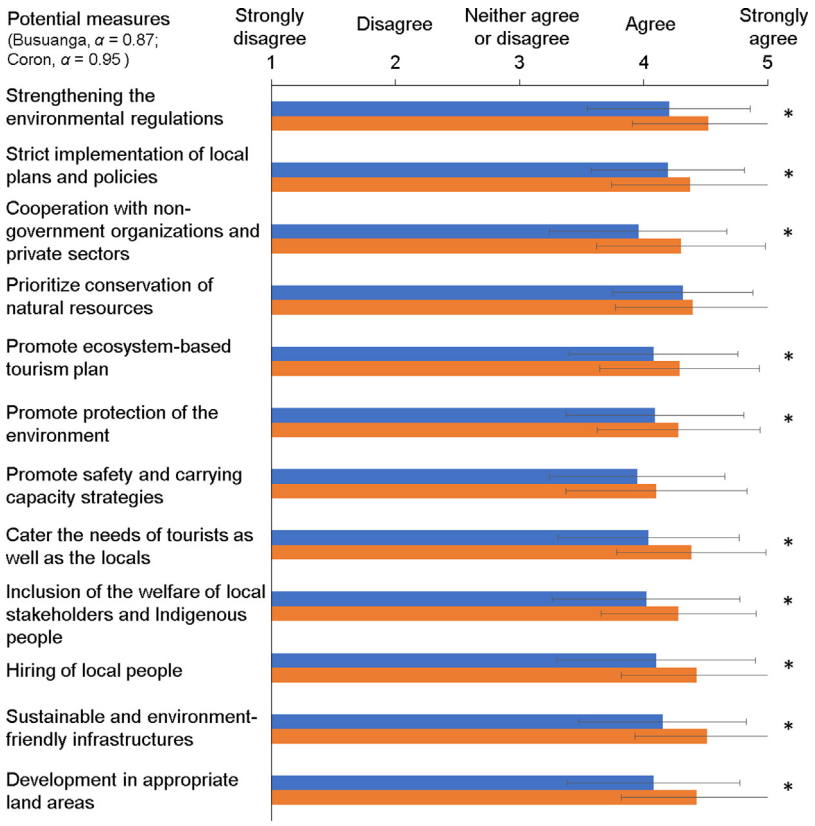

Fig. 5. Respondents' perceived general measures (weighted average and standard deviation) to promote sustainable tourism in Busuanga (blue bars) and Coron (orange bars). Bars with * indicates that the difference of means is statistically significant at $p < 0.05$ using Mann–Whitney U test (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

strategies (Fig. 5). Among the proposed actions, environment-related plans received high recognitions; "Prioritize conservation of natural resources" has the highest mean (4.32) followed by "Strengthening the environmental regulations" ($M = 4.20$) in Busuanga while for Coron, the former has an average of 4.40 and the latter 4.52. Also, "Sustainable and environment-friendly infrastructures" has been acknowledged fairly with a mean of 4.15 and 4.51 in Busuanga and Coron, respectively. Meanwhile, respondents of Busuanga and Coron are less perceptive to the "Promote safety and carrying capacity strategies" plan with averages of 3.95 and 4.10, accordingly. Moreover, the comparison of means using Mann–Whitney U test showed significant results ($p < 0.05$); the locals in Coron have higher perceptions than Busuanga on potential actions for sustainable tourism. For example, "Development in appropriate land areas", "Hiring of local people" and "Cater the needs of tourists as well as the locals" are perceived more by Coron's residents ($M = 4.43$, $M = 4.43$, $M = 4.39$, respectively) compared by the people of Busuanga ($M = 4.10$, $M = 4.08$, $M = 4.04$, $p < 0.05$, respectively).

Correlation and multiple regression analyses were also used to determine what factors could influence residents' views on possible measures to promote sustainable tourism. Table 4 clearly shows that the Busuanga respondents' overall awareness of blue carbon ES positively influences their recognition of the suggested measures. For example, high (low) recognition of mangroves' benefits will result to a high (low) agreement to the following actions: e.g. "Strict implementation of local plans and policies" ($\rho = 0.238$), "Cooperation with NGO and private sectors" ($\rho = 0.299$), and "Prioritize conservation of natural resources" ($\rho = 0.336$) while overall seagrass awareness (high or low) influences for example "Promote safety and carrying capacity strategies" ($\rho = 0.357$), "Cater the needs of tourists as well as the locals" ($\rho = 0.228$), and "Hiring of local people" ($\rho = 0.385$) perceptions. In Coron town, the same associations were recorded except for the perceptions of "Hiring of local people," "Sustainable and environment-friendly infrastructures" and "Development in appropriate land areas" (for seagrass only) measures were not affected by respondents' overall awareness of blue carbon resources. Interestingly, cognizance to "Strengthening the environmental regulations" measure was not attributed to overall ES awareness in both municipalities.

Moreover, regression models of Busuanga show that residents' perceptions of ES, tourism benefits and impacts have a mediating effect to their opinions of sustainable tourism actions (e.g., "Strict implementation of local plans and policies" with $R^2 = 0.100$, $p < 0.05$ and "Cooperation with NGO and private sectors" with $R^2 = 0.237$, $p < 0.01$) except for "Strengthening the environmental regulations" (Supplementary Table 5a). In evaluating the predictor variables, community sentience benefits can positively drive residents' comprehensions of the potential strategies such as "Hiring of local people" ($\beta = 0.547$) and "Sustainable and environment-friendly infrastructures" ($\beta = 0.373$) whereas tourism benefits for personal enhancements have inverse relationships to their views of the said measures; e.g., "Promote protection of the environment" ($\beta = -0.372$) and "Cater the needs of tourists as well as the locals" ($\beta = -0.300$). These opposing directions suggest that locals with high regard for personal gains from tourism are less likely to adopt sustainable measures, and vice versa. In contrast, recognition of "Strengthening the environmental regulations" measure can be facilitated by the independent variables (e.g. awareness) identified in Coron town ($R^2 = 0.373$, $p < 0.01$) (Supplementary Table 5b). All other regression models and β weights of this municipality follow the same pattern reflected in Busuanga.

Table 4
Correlation analysis of respondents' overall awareness of blue carbon ecosystem services with perceived tourism benefits and impacts and potential measures of sustainable tourism.

	Overall awareness of ecosystem services			
	Busuanga		Coron	
	Mangroves	Seagrasses	Mangroves	Seagrasses
Perceived personal benefits				
Personal enhancement	−0.177[a]	−0.220[b]	−0.198[b]	−0.261[c]
Community sentience		−0.181[a]		
Perceived tourism impacts				
Socio-cultural impact				
Economic impact				
Environmental impact				
Perceived sustainable tourism measures				
Strengthening the environmental regulations				
Strict implementation of local plans and policies	0.238[b]	0.324[c]	0.294[c]	0.205[c]
Cooperation with non-government organizations and private sectors	0.299[c]	0.390[c]	0.294[c]	0.183[a]
Prioritize conservation of natural resources	0.336[c]	0.365[c]	0.298[c]	0.202[b]
Promote ecosystem-based tourism plan	0.374[c]	0.369[c]	0.347[c]	0.276[c]
Promote protection of the environment	0.292[c]	0.368[c]	0.392[c]	0.295[c]
Promote safety and carrying capacity strategies	0.243[b]	0.357[c]	0.345[c]	0.295[c]
Cater the needs of tourists as well as the locals	0.241[b]	0.228[b]	0.274[c]	0.179[a]
Inclusion of the welfare of local stakeholders and Indigenous people	0.289[c]	0.283[c]	0.383[c]	0.304[c]
Hiring of local people	0.371[c]	0.385[c]		
Sustainable and environment-friendly infrastructures	0.280[c]	0.302[c]		
Development in appropriate land areas	0.366[c]	0.367[c]	0.199[b]	

[a] $p < 0.10$.
[b] $p < 0.05$.
[c] $p < 0.01$; only statistically significant results are shown.

4. Discussion

The results indicate a significant effect of rural–urban settings to residents' overall perceptions of tourism. The following sections will discuss the highlights of this study with the dichotomy of rural–urban perspectives on (4.1) overall tourism perceptions, (4.2) awareness of blue carbon ES, (4.3) relationship of BCE and tourism, and, lastly, (4.4.) locals' role in sustainable management of resources and tourism.

4.1. Overall tourism perceptions

The results of this study are in agreement with other perception studies of tourism benefits and impacts (e.g., Andereck et al., 2005; Eshliki and Kaboudi, 2012; Hanafiah et al., 2013) such that the local community positively welcomes tourism benefits and impacts that promote socio-cultural and economic welfare. The locals with economic gains are supportive of the tourism industry whereas those who are not benefited have less recognition. The rapid urban expansions observed in Coron in favor of the growing tourism industry will most likely impact the lifestyle of the residents, whether they are positively or negatively affected. Residents who feel tourism is important for their economic developments for both personal (e.g., income source) and the community (e.g., investments) will have a greater positive outlook towards the tourism industry. As reflected in this study, 43.8% of the respondents are salaried individuals where some of them are working in the tourism sector (e.g., transportation, hotels, restaurants). This shows that tourism directly affects the residents' economic welfare. However, as tourism develops in their municipality, prices of goods and services will likely inflate (Tkalec and Vizek, 2016), which becomes a burden to them. Also, a growing number of tourists are competing in their local jobs reducing the chances of residents' employment. Zhang et al. (2006) have stressed that to reduce tensions between tourists and residents, a clear program should be set up in a community.

In the case of Busuanga, where tourism industry is at an earlier phase, tourism benefits and impacts are perceived less by the residents compared to Coron. Despite this, the results of this study indicate that the respondents still have positive views towards the economic benefits of tourism such as a potential source of income and employment opportunities (Tables 1 and 2a). Overall, respondents have low perceptions of tourism impacts which are expected since they are not yet experiencing its effects in the same way Coron's residents are (Table 2a and 2b). These findings can serve as a baseline for Busuanga's tourism master plan which is still in the formulation phase (Municipal Tourism Officer, personal communication, February 17, 2020).

Interestingly, the factors used in this study to predict residents' recognition of direct and indirect benefits as well as the possible impacts show similar trends with other studies. Results of socio-demographics as predictor variables do not always influence their views which were also pointed out by McGehee and Andereck (2004). Alternatively, respondents' perceptions of tourism benefits are effective mediating factors in determining their attitudes towards tourism impacts. For instance, respondents in Coron tend to recognize both the positive and negative impacts of tourism because they are experiencing them. Contrastingly, respondents in Busuanga tend to express the impacts to less extent due to limited perceptions of tourism benefits (and awareness of adverse side-effects). Although this study has established that there is a clear difference in terms of urbanization gradient, it should be noted that the factors which can influence residents' attitudes, as well as the nature and scope of tourism impacts, are likely to be different in individual contexts of each town (Eshliki and Kaboudi, 2012).

4.2. Awareness of blue carbon ecosystem services

Both municipalities tended to have high regard for mangrove ES. They are highly aware of the importance of mangroves because they can visibly appreciate their benefits. For instance, anecdotal accounts include fishing and collecting of shells and other mollusks in mangrove areas when money is limited to buy food in the market. Coastal communities experienced the effectiveness of mangrove ecosystems as coastal protectors when super typhoon Yolanda hit the country in 2013 which was also observed by residents in Eastern Samar province (Quevedo et al., 2020a). The residents also obtain revenues from operating recreational activities such as firefly watching and paddling in mangrove areas. In other areas in the Philippines, mangrove ecosystems are proven to provide economic profits when marketed as a premier tourist site by establishing and managing the area as eco-parks like the Bakhawan and Katunggan It Ibajay Eco-parks (Quevedo et al., 2021b).

Contrastingly, seagrass awareness is perceived based on their benefits. For example, provisioning services such as a good source of fish, shells, and other seafood are recognized by the residents since they frequently conduct fishing and gleaning in seagrass meadows. Alternatively, seagrass beds' role in attenuating strong waves (Hansen and Reidenbach, 2017) is not well recognized to the residents. Interestingly, blue carbon functions of seagrass ecosystems are recognized by the respondents in Busuanga. This could partially be attributed to the efforts of "blue carbon" information campaigns of C3 Philippines, an NGO based in the municipality. This NGO has been conducting several seagrass awareness campaigns in the town as part of their thrusts in the Dugong conservation program (C3 Program Coordinator, personal communication, July 19, 2019). Moreover, the presence of this NGO has been instrumental in engaging local communities to sustainable management of seagrass ecosystems (Quevedo et al., 2021c).

4.3. Linking tourism impacts with blue carbon ecosystems awareness

Several studies have already documented the environmental impacts of tourism industry (e.g., Sunlu, 2003; Hanafiah et al., 2013; Brenner et al., 2018) which are also observed in the two study areas. Given the geographic setting of Busuanga Island, its tourism industry highly depends on the coastal resources including the BCEs. The results of this study indicate that there are no perceived significant damages from tourism to BCEs, in fact, respondents perceived it to be improving (Fig. 4). Similar observations were documented by Kobayashi (2017) from his 2014 assessment in Coron, where 48% of the stakeholders perceived the environment to be improving. In contrast, key informant interviews (KII) of different stakeholders in the island shared how tourism-related activities put pressure on BCEs, potentially resulting in loss of valuable services (Quevedo et al., 2021a).

In a similar vein to the existing studies (e.g., Puryono and Suryanti, 2019; Treephan et al., 2019), perceptions of environmental impacts of respondents correlate with their knowledge of BCE services; the more (less) they are aware of ES, the better (least) they can recognize the impacts. Remarkably, the role of NGOs in increasing community awareness of ES is evident in the study sites. For instance, in Busuanga, local stakeholders know how tourism can potentially affect the benefits and overall state of BCEs (Quevedo et al., 2021c). Similarly, several NGOs based in Coron have promoted the importance of mangrove awareness particularly its role in coastal protection and fishing industry (Municipal Agriculturist, personal communication, July 23, 2019). These groups are instrumental in educating the local communities about the possible environmental impacts of tourism on their coastal and marine resources.

4.4. Residents' perceptions of sustainable tourism

Sustainable tourism aims for the balance between environmental protection and economic development (Dedeke, 2017) while improving the local economies and people's well-being. As local communities are considered to be the most important player given the fact they are most likely affected either positively or negatively by tourism industry, it is considered imperative to determine their views on possible measures of sustainable tourism. The local communities in this study are in agreement that protecting their resources is a necessary step moving forward.

Respondents are highly perceptive of what sustainable tourism should be because of their knowledge of ES as documented in this study. After the super typhoon Yolanda hit the country in 2013, there has been a shift towards the improvement of environmental protection and conservations in line with the tourism industry. As reflected in the results, both municipalities have shared their thoughts that environmental-related measures are priorities since they are highly cognizant of the benefits and services they can get from these ecosystems. These findings are in concordance with Kobayashi's (2017) assessment in 2014, where stakeholders have high regard on environmental protection strategies.

Tourism if not sustainable can result in ecosystem loss. Coron, where residents have first-hand experience of the impacts of tourism on their environment, has higher recognition of promoting a balanced tourism industry. The locals who are displaced due to reclamation projects have seen the loss of their mangrove forests and urged the local government for more appropriate land-use strategies. Meanwhile, in Busuanga where tourism is still at the initial phase and developing, the residents are optimistic that their local government will follow the principles of sustainable tourism.

5. Conclusions

This study investigated residents' perceptions of tourism benefits and impacts from rural (Busuanga) and urban (Coron) perspectives. Factors that influence their perceptions have been documented. As described and analyzed by the authors, sociodemographics, as a mediating factor, is inconclusive, thus, future studies should use demographics with careful consideration. Moreover, locals' perceptions of tourism benefits and impacts and how these two can be correlated suggest the effectiveness of the scale as a tool in assessing tourism perceptions which is one of the objectives of this study. Also, being aware of the various ES can affect how they recognize these impacts and possible measures to counter the environmental changes. The authors highlighted that there are certain variations of perceptions related to tourism even at the relatively macro-scales. The tourism policy is frequently at the state level and the findings of this study indicate the need for further policy fine-tuning adjustments, particularly with scales and rural–urban settings.

This study established that rural–urban settings have a significant effect on how local communities perceived things. It is important to understand the attitudes of the residents in each community to ensure the effective implementation of sustainable tourism measures. Tourism in Busuanga, as mentioned, is still developing so comparing their residents' perceptions with Coron's, as the results show, will enable their local government to prepare an efficient tourism master plan, based on lessons learned and anticipating the drivers and changes in future. Meanwhile, the local government of Coron can implement new sustainable strategies to address existing tourism impacts particularly based on their residents' perceptions. This could be in the form of

prioritizing community awareness and engagement (e.g., BCE and other ecosystem information and education campaigns or IEC and tourism-related trainings and jobs placement) as well as ensuring effective implementation of environmental laws or softer customary regulations or strategies (e.g., solid waste management and BCE conservation and protection) to further enhance their tourism industry. As tourism grows rapidly in these municipalities, a holistic approach should be done including different stakeholders' perceptions, collaborations with NGOs, private and international sectors as well as multidisciplinary and realistic researches. Such networks of social capitals are instrumental in pursuing the sustainable tourism. With that, the results of this research can provide basis for a roadmap for local governments to pursue especially in enabling policies to promote sustainable development that improves environmental conditions and residents' well-being.

Lastly, the global benefits of conservations and tourism at local levels are frequently in a trade-off relationship. The authors did not explore the solutions to the full extent with this study but the results of this study suggest that identifying the indirect drivers (e.g., awareness of blue carbon ES, personal experiences)are significant and good indicators to determine community perceptions of environmental changes in coastal areas where tourism industry exacerbates the vulnerable coastal and marine ecosystems. Although the role of NGOs is not investigated in this study, results implicitly show how important they are in promoting sustainable tourism. The more people are aware of the importance of BCE, the more they recognize environmental protection and conservation measures.

CRediT authorship contribution statement

Jay Mar D. Quevedo: Conceptualization, Methodology, Formal Analysis, Investigation, Writing - Original Draft. **Yuta Uchiyama:** Conceptualization, Validation, Resources, Writing - review and editing. **Ryo Kohsaka:** Conceptualization, Writing - review and editing, Supervision, Project administration, Funding acquisition.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments and funding information

The authors would like to thank the local government units of Busuanga and Coron for their assistance during the conduct of the household surveys. This study is funded by the JSPS KAKENHI Grant Numbers JP20K12398; JP16KK0053; JP17K02105; JP17H01682; Japan Science and Technology Agency (JST) and Japan International Cooperation Agency (JICA) through the Science and Technology Research Partnership for Sustainable Development Program (SATREPS) – Comprehensive Assessment and Conservation of Blue Carbon Ecosystems and Their Services in the Coral Triangle (Blue CARES) project; JST RISTEX Grant Number JPMJRX20B3; Asia-Pacific Network for Global Change Research Grant Number CBA2020-05SY-Kohsaka; Kurita Water and Environment Foundation [20C002].

Appendix A. Supplementary data

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.rsma.2021.101820.

References

Abrenica, M.A., Ilagan, G.A., Liuag, H.L., Napeñas, A., Tabion, R.N., Tamina, R.C., 2017. Municipality of coron ECAN resource management plan 2017-2022. In: Partnership with Municipal Governement of Coron, Municipal ECAN Board, and Palawan Council for Sustainable Development. Available online: https://pcsd.gov.ph/2020/12/11/06-coron-ecan-resource-management-plan/. (Accessed 22 February 2021).

Alongi, D.M., 2008. Mangrove forests: Resilience, protection from tsunamis, and responses to global climate change. Estuar. Coast Shelf S. 76 (1), 1–13. http://dx.doi.org/10.1016/j.ecss.2007.08.024.

Andereck, K.L., Nyaupane, G.P., 2011. Exploring the nature of tourism and quality of life perceptions among residents. J. Travel Res. 50 (3), 248–260. http://dx.doi.org/10.1177/0047287510362918.

Andereck, K.L., Valentine, K.M., Knopf, R.C., Vogt, C.A., 2005. Residents' perceptions of community tourism impacts. Ann. Tour. Res. 32 (4), 1056–1076. http://dx.doi.org/10.1016/j.annals.2005.03.001.

Asah, S.T., Guerry, A.D., Blahna, D.J., Lawler, J.J., 2014. Perception, acquisition and use of ecosystem services: Human behavior, and ecosystem management and policy implications. Ecosyst. Serv. 10, 180–186. http://dx.doi.org/10.1016/j.ecoser.2014.08.003.

Avau, J., Cunha-Lignon, M., De Myttenaere, B., Godart, M.-F., Dahdouh-Guebas, F., 2011. The commercial images promoting Caribbean Mangroves to tourists: Case studies in Jamaica, Guadeloupe and Martinique. J. Coast. Res. 64, 1277–1281.

Bautista, M.A., Malolos, G.A., Magyaya, A., Palevino, M.L., Suarez, M.A., 2017. Municipality of busuanga ECAN resources management plan 2017-2022. In: Partnership with Municipal Governement of Coron, Municipal ECAN Board, and Palawan Council for Sustainable Development. Available online: https://pcsd.gov.ph/2020/12/11/07-busuanga-ecan-resource-management-plan/. (Accessed on 22 February 2021).

Brenner, L., Engelbauer, M., Job, H., 2018. Mitigating tourism-driven impacts on Mangroves in Cancún and the Riviera Maya, Mexico: An evaluation of conservation policy strategies and environmental planning instruments. J. Coast. Conserv. 22, 755–767. http://dx.doi.org/10.1007/s11852-018-0606-0.

Cuellar-Martines, T., Ruiz-Fernández, A.C., Sanchez-Cabeza, J.A., Pérez-Bernal, L.H., Sandoval-Gil, J., 2019. Relevance of carbon burial and storage in two contrasting blue carbon ecosystems of a northeast Pacific coastal lagoon. Sci. Total Environ. 675, 581–593. http://dx.doi.org/10.1016/j.scitotenv.2019.03.388.

Dedeke, A., 2017. Creating sustainable tourism ventures in protected areas: An actor-network theory analysis. Tour. Manag. 61, 161–172. http://dx.doi.org/10.1016/j.tourman.2017.02.006.

Duarte, C.M., Losada, I.J., Hendriks, I.E., Mazarrasa, I., Marba, N., 2013. The role of coastal plant communities for climate change mitigation and adaptation. Nat. Clim. Chang. 3, 961–968. http://dx.doi.org/10.1038/nclimate1970.

Duarte, C.M., Middelburg, J., Caraco, N., 2005. Major role of marine vegetation on the oceanic carbon cycle. Biogeosciences 2, 1–8. http://dx.doi.org/10.5194/bg-2-1-2005,2005.

Dyer, P., Aberdeen, L., Schuler, S., 2007. Tourism impacts on an Australian indigenous community. Tour. Manag. 24, 83–95. http://dx.doi.org/10.1016/S0261-5177(02)00049-3.

Eshliki, S.A., Kaboudi, M., 2012. Community perception of tourism impacts and their participation in tourism planning: A case study of ramsar. Iran. Procedia Soc. Behav. Sci. 36, 333–341. http://dx.doi.org/10.1016/j.sbspro.2012.03.037.

Farber, S.C., Costanza, R., Wilson, M.A., 2002. Economic and ecological concepts for valuing ecosystem services. Ecol. Econ. 41 (3), 375–392. http://dx.doi.org/10.1016/S0921-8009(02)00088-5.

Fortes, M.D., Santos, K., 2004. Seagrass ecosystem of the Philippines: Status, problems and management directions. In: DA-BFAR (Ed.), Turbulent Seas: The Status of Philippine Marine Fisheries. Coastal Resource Management Project, Cebu City.

Greiner, R., 2010. Improving the net benefits from tourism for people living in remote northern Australia. Sustainability 2, 2197–2218. http://dx.doi.org/10.3390/su2072197.

Hanafiah, M.H., Jamaluddin, M.R., Zulkifly, M.I., 2013. Local community attitude and support towards tourism development in Tioman Island, Malaysia. Procedia Soc. Behav. Sci. 105, 792–800. http://dx.doi.org/10.1016/j.sbspro.2013.11.082.

Hansen, J.C.R., Reidenbach, M.A., 2017. Turbulent mixing and fluid transport within florida bay seagrass meadows. Adv. Water Resour. 108, 205–215. http://dx.doi.org/10.1016/j.advwatres.2017.08.001.

Harrill, R., 2004. Residents' attitudes toward tourism development: A literature review with implications for tourism planning. J. Plan. Lit. 18 (3), 251–256, https://doi.org/10.1177%2F0885412203260306.

Ingold, T., 2000. The Perception of the Environment: Essays on Livelihood, Dwelling and Skill. Taylor and Francis, London, UK.

Ko, D.W., Stewart, W.P., 2002. A structural equation model of residents' attitudes for tourism development. Tour. Manag. 23 (5), 521–530. http://dx.doi.org/10.1016/S0261-5177(02)00006-7.

Kobayashi, M., 2017. Promoting sustainable tourism in Coron Island, Palawan province, Philippines. In: Papers on Environmental Information Science Vol 31 (The 31th Conference on Environmental Information Science), pp. 263–268.

Kohsaka, R., 2010. Developing biodiversity indicators for cities: Applying the DPSIR model to nagoya and integrating social and ecological aspects. Ecol. Res. 25, 925–936. http://dx.doi.org/10.1007/s11284-010-0746-7.

Kumar, M., Kumar, P., 2008. Valuation of ecosystem services: A pysho-cultural perspective. Ecol. Econ. 64, 808–819. http://dx.doi.org/10.1016/j.ecolecon.2007.05.008.

Lhoest, S., Dufrêne, M., Vermeulen, C., Oszwald, J., Doucet, J.-L., Fayolle, A., 2019. Perceptions of ecosystem services provided by tropical forests to local populations in Cameroon. Ecosyst. Serv. 38, 100956. http://dx.doi.org/10.1016/j.ecoser.2019.100956.

Liu, X(R), Li, J(J), 2018. Host perceptions of tourism impact and stage of destination development in a developing country. Sustainability 10, 2300. http://dx.doi.org/10.3390/su10072300.

Lukman, K.M., Quevedo, J.M.D., Kakinuma, K., Uchiyama, Y., Kohsaka, R., 2019. Indonesia provincial spatial plans on mangroves in era of decentralization: Application of content analysis to 27 provinces and "blue carbon" as overlooked components. J. For. Res. 24 (6), 341–348. http://dx.doi.org/10.1080/13416979.2019.1679328.

Lukman, K.M., Uchiyama, Y., Quevedo, J.M.D., Kohsaka, R., 2020. Local awareness as an instrument for management and conservation of seagrass ecosystem: Case of berau regency, Indonesia. Ocean Coast. Manag. 2020, 105451. http://dx.doi.org/10.1016/j.ocecoaman.2020.105451.

MacFarland, T.W., Yates, J.M., 2016. Mann–Whitney U test. In: Introduction To Nonparametric Statistics for the Biological Sciences using R. Springer, Cham, pp. 103–132.

Marshes, Salt, 2017. In: United Nations (Ed.), The First Global Integrated Marine Assessment: World Ocean Assessment I. Cambridge University Press, Cambridge, pp. 887–892.

McGehee, N., Andereck, K.L., 2004. Factors predicting rural residents' support of tourism. J. Travel Res. 43, 131–140. http://dx.doi.org/10.1177/0047287504268234.

McLeod, E., Chmura, G.L., Bouillon, S., Salm, R., Bjork, M., Duarte, C.M., Lovelock, C.E., Schlesinger, W.H., Silliman, B.R., 2011. A blueprint for blue carbon: toward an improved understanding of the role of vegetated coastal habitats in sequestering CO2. Front. Ecol. Environ. 9 (10), 552–560. http://dx.doi.org/10.1890/110004.

Millennium Ecosystem Assessment (MEA), 2005. Ecosystems and Human Well-Being. Island Press, Washington (DC), pp. 25–36.

Muenzel, D., Martino, S., 2018. Assessing the feasibility of carbon payments and payments for ecosystem services to reduce livestock grazing pressure on saltmarshes. J. Environ. Manag. 225, 46–61. http://dx.doi.org/10.1016/j.jenvman.2018.07.060.

Mukherjee, N., Sutherland, W.J., Dicks, L., Huge, J., Koedam, N., Dahdouh-Guebas, F., 2014. Ecosystem service valuations of mangrove ecosystems to inform decision making and future valuation exercises. PLoS One 9, e107706. http://dx.doi.org/10.1371/journal.pone.0107706.

Nordlund, L.M., Jackson, E.L., Nakaoka, M., Samper-Villarreal, J., Beca-Carretero, P., Creed, J.J., 2018. Seagrass ecosystem services –What's next? Mar. Pollut. Bull. 134, 145–151. http://dx.doi.org/10.1016/j.marpolbul.2017.09.014.

Okazaki, E., 2008. A community-based tourism model: Its conception and use. J. Sustain. Tour. 16 (5), 511–529. http://dx.doi.org/10.1080/09669580802159594.

Ouko, C.A., Mulwa, R., Kibugi, R., Owuor, M.A., Zaehringer, J.G., Oguge, N.O., 2018. Community perceptions of ecosystem services and the management of Mt. Marasabit forest in northern Kenya. Environments 5 (11), 121. http://dx.doi.org/10.3390/environments5110121.

Pendleton, L., Donato, D., Murray, B.C., Crooks, S., Jenkins, W.A., Sifleet, S., Craft, C., Fourqurean, J.W., Kauffman, J.B., Marbà, N., et al., 2012. Estimating global blue carbon emissions from conversion and degradation of vegetated coastal ecosystems. PLoS One 7, e43542, http://dx.doi.org/10.1371/journal.pone.0043542.

Puryono, S., Suryanti, S., 2019. Degradation of mangrove ecosystem in Karimunjawa Island based on public perception and management. IOP Conf. Ser.: Earth Environ. Sci. 246 (01280).

Quevedo, J.M.D., Uchiyama, Y., Kohsaka, R., 2020a. Perceptions of local communities on mangrove forests, their services and management: implications for Eco-DRR and blue carbon management for Eastern Samar, Philippines. J. For. Res. 25 (1), 1–11. http://dx.doi.org/10.1080/13416979.2019.1696441.

Quevedo, J.M.D., Uchiyama, Y., Kohsaka, R., 2020b. Perceptions of the seagrass ecosystems for the local communities of Eastern Samar, Philippines: Preliminary results and prospects of blue carbon services. Ocean Coast. Manag. 191, 105181. http://dx.doi.org/10.1016/j.ocecoaman.2020.105181.

Quevedo, J.M.D., Uchiyama, Y., Kohsaka, R., 2021a. A blue carbon ecosystems qualitative assessment applying the DPSIR framework: Local perspectives of global benefits and contributions. Mar. Policy 128, 104462.

Quevedo, J.M.D., Uchiyama, Y., Kohsaka, R., 2021b. Local perceptions of blue carbon ecosystem infrastructures in Panay Island, Philippines. Coast. Eng. J. (forthcoming), https://doi.org/10.1080/21664250.2021.1888558.

Quevedo, J.M.D., Uchiyama, Y., Lukman, K., Kohsaka, R., 2021c. How blue carbon ecosystems are perceived by local communities in the coral triangle: Comparative and empirical examinations in the Philippines and Indonesia. Sustainability 13 (1), 127. http://dx.doi.org/10.3390/su13010127.

Raymond, C., Brown, G., 2007. A spatial method for assessing resident and visitor attitudes toward tourism growth and development. J. Sustain. Tour. 15 (5), 520–540. http://dx.doi.org/10.2167/jost681.0.

Secretariat of the Convention on Biological Diversity (SCBD), 2012. Cities and biodiversity outlook (CBO). https://www.cbd.int/doc/health/cbo-action-policy-en.pdf. (Accessed 1 May 2020).

Spalding, M., Parrett, C.L., 2019. Global patterns in mangrove recreation and tourism. Mar. Policy 103540. http://dx.doi.org/10.1016/j.marpol.2019.103540.

Sunlu, U., 2003. Environmental impacts of tourism. In: Camarda, D., Grassini, L. (Eds.), Local Resources and Global Trades: Environments and Agriculture in the Mediterranean Region. CIHEAM, Bari, pp. 263–270, (Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 57).

Taber, K.S., 2018. The use of cronbach's alpha when developing and reporting research instruments in science education. Res. Sci. Educ. 48, 1273–1296. http://dx.doi.org/10.1007/s11165-016-9602-2.

Tkalec, M., Vizek, M., 2016. The price tag of tourism: Does tourism activity increase the prices of goods and services? Tour. Econ. 22 (1), 93–109. http://dx.doi.org/10.5367/te.2014.0415.

Tomeldan, M.V., 2009. Tourism structure plan of busuanga and coron, Northern Palawan: Comprehensive development through tourism. Muhon 1, 16–27.

Treephan, P., Visuthismajarn, P., Isaramalai, S.-A., 2019. A model of participatory community-based ecotourism and mangrove forest conservation in Ban Hua Thang, Thailand. AJHTL 8 (5).

Uchiyama, Y., Kohsaka, R., 2016. Cognitive value of tourism resources and their relationship with accessibility: A case of noto region, Japan. Tour. Manag. Perspect. 19, 61–68. http://dx.doi.org/10.1016/j.tmp.2016.03.006.

Uchiyama, Y., Kohsaka, R., 2019. Application of the city biodiversity index to populated cities in Japan: Influence of the social and ecological characteristics on indicator-based management. Ecol. Indic. 106, 105420. http://dx.doi.org/10.1016/j.ecolind.2019.05.051.

Uddin, M.S., Steveninck, E.de.Ruyter.van., Stuip, M., MAR., Shah, 2013. Economic valuation of provisioning and cultural services of a protected mangrove ecosystem: A case study on Sundarbans reserve forest, Bangladesh. Ecosyst. Serv. 5, 88–93. http://dx.doi.org/10.1016/j.ecoser.2013.07.002.

Vanderklift, M.A., Marcos-Martinez, R., Butler, J.R.A., Coleman, M., Lawrence, A., Prislan, H., Steven, A.D.L., Thomas, S., 2019. Constraints and opportunities for market-based finance for the restoration and protection of blue carbon ecosystems. Mar. Policy 107, 103429. http://dx.doi.org/10.1016/j.marpol.2019.02.001.

Vargas-Sánchez, A., Oom do Valle, P., da Costa Mendes, J., Silva, J.A., 2015. Residents' attitude and level of destination development: An international comparison. Tour. Manag. 48, 199–210. http://dx.doi.org/10.1016/j.tourman.2014.11.005.

Wawo, M., Adrianto, L., Bengen, D.G., Wardiatno, Y., 2014. Valuation of seagrass ecosystem services in Kotania Bay Marine Nature Tourism Park, Western Seram, Indonesia. Asian J. Sci. Res. 7 (4), 591–600. http://dx.doi.org/10.3923/ajsr.2014.591.600.

Xu, S., Barbieri, C., Anderson, D., Leung, Y.F., Rozier-Rich, S., 2016. Residents' perceptions of wine tourism development. Tour. Manag. 55, 276–286. http://dx.doi.org/10.1016/j.tourman.2016.02.016.

Zhang, J., Inbakaran, R.J., Jackson, M., 2006. Understanding community attitudes towards tourism and host-guest interaction in the urban-rural border region. Tour. Geogr. 8 (2), 182–204. http://dx.doi.org/10.1080/14616680600585455.