



Decision Making in Social Ecological Systems: The Influence of ‘Van Chai’ on Decision Making in Biosphere Reserves and Marine Protected Areas in Vietnam

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ABSTRACT

Contextualisation in environmental management has been recognised for its importance for sustainable development for several decades. The provision of empirical justification for this understanding is however not extensively available. Analysis of empirical data is conducted for this provision through research in decision making processes and participation in two specific social-ecological contexts in Vietnam, i.e. the Cu Lao Cham-Hoi An Biosphere Reserve and the Ran Trao Marine Protected Area in Vietnam. Questionnaire based quantitative analysis included the exploration of differences between and within the two research areas from both a participation rate and a decision-making perspective. The analysis reveals that differentiations exist between the different levels of social organisation for both participation rate and decision making. Measures of association can be found indicating that the odds of the occurrence of participatory and non-participatory processes in everyday village life increases or decreases the occurrence of participatory processes in the management approach. The social and cultural organisation of these two research areas, when compared to similar research conducted in Vietnam reveals that “Van Chai”, a village organisation based on kinship and livelihood, provides explanation as to why these differentiations exist. The presence of “Van Chai” reveals that the notion of contextualising Integrated Coastal Zone Management finds its necessity not only in an ecological system, but also in a social system, i.e. in a social-ecological system.

Keywords: Social-ecological systems; Decision making; Participation

INTRODUCTION

Integrated Coastal Zone Management as a management approach knows various disciplinary and interdisciplinary siblings. It proclaims to be an umbrella approach; a holistic framing of its brothers and sisters [1]. Consequently, Integrated Coastal Zone Management presides in its vagueness and ‘openness to interpretation’ with other umbrella conceptualisations such as sustainable development. Current research in Integrated Coastal Zone Management has evolved into context specific research; i.e. case studies that encompass international regions, both from an administrative or an ecosystem perspective, countries, and regions within or across countries. Therefore, and subsequent, Integrated Coastal Zone Management is defined within a specific context; for this research being Vietnam.

Research areas

Two research areas were included based on a superficial similarity in ecosystem specificities and a difference in management

approach. Both research areas are set in areas where community members are highly dependent for their livelihoods on coral reefs. The superficial nature of the similarity is due to one research area geographically being located on the mainland, i.e. Ran Trao Locally Managed Marine Area, and one research area being an archipelago, i.e. Cu Lao Cham Marine Protected Area and Biosphere Reserve [2,3]. The subsequent ecological differences are expressed in species differentiation, differentiation in influence from mainland, offshore or upstream. Both research areas are geographically located closely together making them prone to similar or the same weather and climatic influences such as droughts, monsoon patterns, and typhoon patterns. Other differences can be found in fishing patterns: The mainland area receives mainly domestic fishermen; the archipelago receives additionally foreign fishermen.

Besides ecological differences and similarities, an obvious differentiation can be noted between island and mainland (rural) communities. On the archipelago a significant influence can be identified from a military presence [4,5]. The differentiation

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between these communities is not considered a restraining factor but is taken into account when comparing the two areas. Additionally, differentiation exists within the communities.

Management approach

As it is the aim of this research to identify whether management approaches, the associated notions of participation and knowledge sharing, and the notions of sustainable development and sustainability need to be translated to the context in which they exist, two different management contexts were chosen to allow for comparison in approach.

The Ran Trao Locally Managed Marine Area was set up by a non-governmental organisation with the aim of giving ownership to the local community. Specifically, this indicates that the area is managed by the local community themselves in cooperation with the local authorities [6]. In practice this translates for example in community based patrol teams: developed, implemented and financed by the community. Support from the non-governmental organisation is needs based, providing knowledge and capacity building support when requested [6].

The Cu Lao Cham Marine Protected Area and Biosphere Reserve is a government developed and implemented approach; part of the national Marine Protected Area network and the international Man and Biosphere Reserve programme. The Cu Lao Cham Marine Protected Area (MPA) and Biosphere Reserve (BR) apply a participatory approach, allowing stakeholders in the decision-making process. Subsequently, the Cu Lao Cham archipelago is managed by MPA and BR appointed community members, in cooperation and under the supervision of local authorities [3]. In practice this results for example in MPA appointed community patrol teams, financed and supervised by local authorities.

MATERIALS AND METHODS

Respondents

One recruitment strategy was used, following the administrative requirements of Vietnamese communities. An introduction and permission letter from a national government institute and a Vietnamese non-governmental organisation was sent to local authorities to introduce the research. Subsequently, an introduction letter is sent by this local authority to local village leaders with a request for permission to conduct research in their respective villages. As an initial step, interviews with these village leaders are conducted to gather baseline socio-economic and demographic information. Limited official (statistical) data exists on demographics and socio-economic information at village level. This information is tacit; reassessing this data afterwards showed high reliability. Repeat visits to the villages and informal gatherings with village leaders and community members are necessary to establish mutual trust and commitment. Adhering to Vietnamese social and cultural values and traditions, village leaders were asked to invite community members to participate in the questionnaire. The invitations were sent out according to the stratified random sample as determined based on the demographic and socio-economic information in combination with the existing stakeholder characteristics as set by the respective management approaches.

The questionnaires were conducted on paper, face to face with the aid of translators. The choice for manual, face to face questionnaires

is based on the level of formal education and the high illiteracy rate in the research areas. Pilot questionnaires were conducted to limit confusion and optimise the accompanying guidelines. Each questionnaire was translated with the aid of a local translator to adhere to the local dialect. However, additional information and guidance beforehand was needed to explain for example likert scales and to provide additional information such as the differentiation between knowledge and skills. Translators were chosen based on their understanding of the research topic, their level of knowledge on the local dialect and their research experience. Availability of these translators was considered a significant restraint and trainings were needed to achieve scientific and academic rigour.

The identification of respondents is based on stratified random sampling. Respondents are limited to one respondent per household, indicating that the number of respondents is a representation of the number of households present in the communities ($n=273$). Strata are set according to the various employment categories as deemed relevant in accordance with the stakeholder characteristics of the respective management approaches; fishermen, farmers, services (i.e. sales and others; entailing management related activities such as handicrafts, homestays etc.). The choice to follow stakeholder characteristics of management approaches is made to allow for comparison, although limited, with other research conducted in Vietnam, within a similar research setting. Research within Integrated Coastal Zone Management is mainly conducted based on a case study approach, in which case studies are based on similar or the same stakeholder characteristics [7]. 309 households were invited of which 273 agreed to participate (88.35%, μ age=47.27, min. 19; max. 81). Due to the strata being set to adhere to stakeholder characteristics no gender equality is strived for. The random sampling however resulted in gender equality being achieved (Male 48.1%; Female 51.9%). An overview of the number of respondents per research area per strata, divided per village. The choice for the division per village is made based on vast variability between villages due to their geographical location. The community on Cu Lao Cham is divided in four villages; of which three are located adjacent each other namely Thon Bai Ong, Thon Cam and Bai Lang, the fourth village, Bai Huong, is located on the other side of Cu Lao Cham. This division leads to differentiations such as accessibility to/from the mainland, outsider influence (i.e. tourism), accessibility to social services such as medical facilities, schools, as well as differentiation in cultural values and traditions. In Van Hung commune in the Ran Trao Locally Management Marine Area, the division is noticeable due to the geographical differentiation being either sea or rural area adjacent. This division is magnified due to the presence of a highway dividing the commune in two areas. The Van Hung Commune consists of 6 villages creating the following division; Xuan Tu 1, Xuan Tu 2 and Xuan Vinh being sea adjacent and Xuan Tay, Xuan Dong and Ha Gia being rural area adjacent (Table 1).

The variation between the intended and the actual number of respondents according to the stakeholder criteria per village results from the manner in which respondents are invited. Conducting questionnaires in Vietnam is preceded by an invitation letter sent out through traditional channels; in both research areas being the current village leaders. The strata were explicated and invitations were sent out according to these requirements; the actual number however differs as a result of inconsistencies, availability, willingness or incorrect socio-economic and demographic data.

Table 1: Overview of respondents organised per research area and per village (Intended and Actual respondents).

Village	Farmers		Fishermen		Services		Total	
	Intended	Actual	Intended	Actual	Intended	Actual	Intended	Actual**
Vạn Hưng Commune								
Xuân Tụ 1	12	5	14	5	9	17	35	31(4)
Xuân Tụ 2	11	11	18	16	2	9	31	37(1)
Xuân Vinh	9	7	9	12	/	/	18	19
Xuân Tây	2	11	15	2	6	1	23	14
Xuân Đông	25	18	/	2	/	7	25	27
Hà Già	3	4	10	10	4	2	17	17(1)
Total Vạn Hưng	62	56	66	47	21	36	149	145
Cù Lao Chàm								
Thôn Bãi Ông	8	1	24	21	8	5	40	29(1)
Thôn Cầm	/	2	32	15	8	9	40	28(2)
Bãi Làng	/	/	32	13	8	17	40	31(2)
Bãi Hương	/	3	32	14	8	8	40	27(1)
Total Cù Lao Chàm	8	6	120	63	32	39	160	115
Total	70	62	186	110	53	75	309	273*

Note: * Valid: 260 - Total: 273 - Missing: 13/** Total Actual Number included households with no source of income (n=13)

Instrument

Data was collected using a non-standardised questionnaire. Sections of the questionnaire are based on standardised questionnaires but these were not incorporated fully. Standardisation could not be achieved for this research; therefore standardisation during analysis is conducted (Z-scores). The questionnaire is divided in two sections; participation rate and decision making.

Participation rate

A wide range of gauged stakeholder participation methodologies exist within the environmental management framework such as stakeholder analysis, environmental impact assessment, social network analysis, strategic environmental assessment etc. [8-10]. Most tools used within this framework however serve a management goal [11]. No gauged questionnaires and surveys exist, encompassing stakeholder decision making processes, inclusive of participation incentives, participation rate, and knowledge gaining and sharing.

The subscale 'Participation rate' is a dichotomous Yes/No question and contains 28 items ($\alpha=0.913$; e.g. community coastal clean-up). It encompasses the range of activities related to the management of the areas both within the frame of the management approach and in everyday village life.

Decision making process

The section on decision making consists of two subscales; 'decision making in everyday village life' ($\alpha=.619$; 6 items; e.g. we listen to each other's opinion but it is the village leader who has the final word.) and 'decision making in the management process' ($\alpha=.686$; 12 items; e.g. we listen to each other's opinions and decide together). Both subscales are rated on a five-point likert scale indicating 1 (strongly disagree), 2 (disagree), 3 (agree not disagree), 4 (agree), 5 (strongly agree).

Analysis

The analysis was conducted on two levels; participation rate and decision making. In an initial step dimension reduction is conducted on 'participation rate' via Exploratory Factor Analysis (EFA). EFA is

conducted using the analysis tool International Business Machine (IBM) Statistical Package for Social Sciences (SPSS) Statistics 23 (SPSS Inc., Armonk, NY) and consists of the following steps. A visual representation of correlations is computed to provide insight in the underlying relationships between the subscale items. Subsequently, EFA is computed without prior determination of the number of factors. The reliability of the proposed factors is computed based on Cronbach's alpha; items are regrouped in case of increased Cronbach's alpha when item removed [12]. This regrouping is conducted based on the correlation matrix, additional EFA's and recomputed reliability. The exploratory factor analysis is conducted in combination with an exploration of reliability based on confirmatory factor analysis. Guttman split half was conducted to assess stability [13].

Participation rate

Dimension reduction is conducted on the scale 'participation rate' via Exploratory Factor Analysis (EFA). A visual representation of correlations is computed to provide in-sight in the underlying relationships between the scale items. Subsequently, EFA is computed without prior de-termination of the number of factors. The reliability of the proposed factors is computed based on Cronbach's Alpha; items are regrouped in case of increased Cronbach's alpha when item removed. A Cronbach's alpha of .70 is considered statistically acceptable [14]. This regrouping is conducted based on the correlation matrix, the scree plot, additional EFA's and recomputed reliability. The EFA for the scale 'participation rate' resulted in the creation of three subscales 'Environmental Planning' ($\alpha=.834$, e.g. zoning), 'Management Implementation activities' ($\alpha=.904$, e.g. Alternative livelihood), and 'Long term planning/ Education and Awareness activities' ($\alpha=.823$, e.g. community coastal clean-up). Stability is tested using Guttman split half [13]. The analysis conducted in relation to participation rate is based on descriptive statistics. Additionally difference queries are conducted to determine whether a significant relationship can be determined between participation rate and the location in which stakeholders reside. These queries are conducted via cross-tabulation using chi square statistics.

Decision making processes

No dimension reduction is conducted on the two 'decision making' subscales; rather an item-to-item comparison is made between the subscales. Cross-tabulation is used to determine correlations and statistical significance. Correlations are computed using Cramer's V statistic; Chi square statistics are used for statistical significance; for those tables with an expected count less than 5, Fisher Exact test is used. For these instances, the Monte Carlo statistic is used to determine the significance of the Cramer's V statistic. Furthermore, odds ratios are calculated to determine the possibility that the occurrence of one item influences the occurrence of another item. Odds Ratios are also computed to determine the possibility of relations differing for two independent samples. Odds ratio is used to determine the relative odds of the occurrence of decision making processes in the management process, given the occurrence of decision making processes in everyday village life. Odds ratios are commonly used in case-control studies, but they can also be used for cross-sectional and cohort studies. Specifically, odds ratios are used over prediction models as they show the relative benefit without making assumption about cause-effect relationships. Often, logistic regression is used to study the effect other variables have on the relationship determined in the odds ratio [15]. For this analysis, logistic regression is however not used as the goal of the analysis is to determine the relationship between the context of everyday village life and the management approach concerning decision making. It is not the goal of the analysis to determine the prediction value of other variables. Odds ratios are a commonly used method in environmental sciences to determine the odds of the occurrence of a management outcome, given the occurrence of a certain management process (e.g. Flow experiments) [16].

RESULTS

Participation rate

Exploratory Factor Analysis (EFA): The Kaiser-Meyer-Olkin measure of sampling adequacy of .895 indicated that the survey items were sufficiently correlated to warrant conducting a factor analysis. The initial Exploratory Factor Analysis (EFA) reveals that two items show zero variance. These two items correspond with the items in the questionnaire "others". As only two respondents indicated other activities, conceptual argumentation supports the initial EFA and the items are removed. The choice is made to conduct a preliminary EFA without pre-determination of the number of factors. The items of the subscale "participation rate" are based on analysis from previously conducted qualitative research and document analysis conducted to determine the different activities that are conducted within the management approach of the two research areas. Therefore, no theoretical argumentation is used. The initial EFA resulted in a seven-factor solution. Based on factor loadings >.4, factor four through seven reveal significant noise due to

the low number of items being included (factor 6 and 7: 2 items; factor 4 and 5: 3 items) and low factor loadings. The eigenvalues of all factors are higher than 1.0 accounting for 72.163 of the total variance explained. Factor 1 has an eigenvalue of 9.860 and factor 2 has an eigenvalue of 2.913. All other factors had eigenvalues less than 2.0 (respectively 1.899, 1.810, 1.430, 1.430, 1.242, and 1.052). Conceptual inconsistencies support the three-factor solution and based on the screen-plot of eigenvalues and with a total variance explained of 52.389, a three factor solution is deemed more appropriate. Internal consistency for the seven-factor solution is calculated based on Cronbach's alpha. The Cronbach's alpha shows acceptable reliability for all factors. However for factor four through seven reliability increases when items are removed. After conducting the EFA with a three factor solution, the Cronbach's alphas are used for comparison with those of the three-factor solution to determine the most reliable factor-solution. For factor one in the three factor solution, argumentation could be made based on Cronbach's alpha that one item could either be removed or placed in another factor based on factor loading. The factor loading is however the highest in factor 1, and the Cronbach's alpha would only increase by .005. In combination with conceptual argumentation, the choice is made to keep the item in factor 1. Factor 2 and 3 are straightforwardly reliable with no increase in Cronbach's alpha when items removed and factor loadings corresponding with theoretical argumentation. The following factors are identified; 'Environmental Planning' ($\alpha=.834$) indicating all activities in the development phase (e.g. Zoning), 'Long term planning/Education and awareness activities' ($\alpha=.823$) indicating all activities in the implementation phase open to all community members (e.g. community coastal clean-up) and activities concerning the identification of social and cultural issues in the development phase (e.g. developing the community profile), and 'Management implementation' ($\alpha=.904$) indicating all activities related to the management of the coral reefs (e.g. patrol groups and alternative livelihood activities) (Table 2).

Confirmatory Factor Analysis (CFA): A confirmatory factor analysis is composed of 28 items and three subscales, 'Planning Implementation' (Long Term Planning/Education and Awareness activities; items V12f1, V12g1, V12k1, V12m1, V12n1, V12o1, V12p1, V12q1, V12s1, V12bb1), 'Environment Planning' (Environmental Planning; items V12a1, V12b1, V12c1, V12d1, V12e1), and 'Management Implementation' (Management Implementation; items: V12h1, V12i1, V12j1, V12l1, V12r1, V12t1, V12u1, V12v1, V12w1, V12x1, V12y1, V12z1, V12aa1). 15 Co-variances (Cov (e27,e26); Cov (e26,e23); Cov (e26,e22); Cov (e25,e22); Cov (e23,e22); Cov (e26,e21); Cov (e25,e20); Cov (e23,e19); Cov (e22,e19); Cov (e26,e18); Cov (e23,e18); Cov (e17,e16); Cov (e11,e10); Cov (e10,e7); Cov (e11,e7) were set as free parameters to improve model fit. The 3-factor model fits data acceptably: $\chi^2/df=1.953$, CFI=.874, RMSEA=.074. The parameter estimates of the CFA are shown in Figure 1.

Table 2: Factor loadings of EFA (5), EFA (3) and CFA (3).

		EFA1 Factor (5) (N=136)	EFA1 Factor (3) (N=136)	CFA Factor (3) (N=261)
Factor reliability based on Cronbach's alpha	Factor stability based on Guttman split half	A	A	L4
Factor 1	0.881	0.834		0.783
Factor 2	0.759	0.823		0.82
Factor 3	0.778	0.904		0.836
Factor 4	0.765			
Factor 5	0.701			

Factor 6	0.721	
Factor 7	0.844	
Factor items		
Factor 1: Environmental planning		
[V12a1] Identification of environmental issues	0.48	0.52
[V12b1] Identification of the protected area	0.75	0.72
[V12c1] Resource assessment	0.64	0.67
[V12d1] Defining the protected location	0.74	0.77
[V12e1] Zoning	0.63	0.69
Factor 2: Long term planning/Education and awareness activities		
[V12f1] Developing the community profile	0.47	0.53
[V12g1] Developing the project vision	0.5	0.73
[V12k1] Approving (endorsing) the project plan	0.56	0.56
[V12m1] Education and awareness activities	0.67	0.59
[V12n1] Music and/or poetry compositions	0.61	0.56
[V12o1] Performances	0.65	0.54
[V12p1] Community coastal clean up	0.64	0.42
[V12q1] Capacity building activities	0.53	0.66
[V12s1] Alternative livelihood	0.58	0.65
[V12bb1] Advocacy	0.61	0.58
Factor 3: Management Implementation		
[V12h1] Developing projects objectives and goals	0.63	0.7
[V12i1] Defining the project activities	0.5	0.61
[V12j1] Writing the project plan	0.68	0.77
[V12l1] Implementing the project plan	0.53	0.6
[V12r1] Using sustainable alternatives to livelihood activities	0.5	0.42
[V12t1] Core group	0.84	0.81
[V12u1] communication group	0.74	0.73
[V12v1] Livelihood group	0.65	0.73
[V12w1] Calm group	0.59	0.66
[V12x1] Study tours	0.65	0.62
[V12y1] Monitoring	0.81	0.79
[V12z1] Evaluating the project	0.67	0.74
[V12aa1] Networking	0.74	0.73

Note: ¹Rotated loadings (>.4) using varimax rotation. Kaiser-Meyer-Olkin measure of sampling adequacy =.803; Confirmatory Factor Analysis (CFA); Exploratory Factor Analysis (EFA)

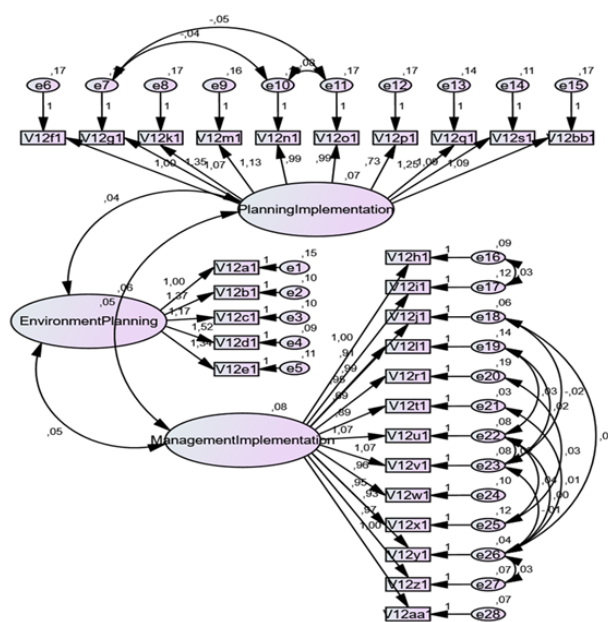


Figure 1: Confirmatory factor analysis in 3-factor solution.

Statistics analysis

Based on the frequency of the different factors, namely in case participation in one of the items of the 3 factor-solutions occurs, a clear difference in participation rate can be determined. About half of the community indicates being involved in the development phase of the management project (Environmental Planning=56.0% participation), more than half participates in alternative livelihood activities or as a member of a community management group (Management Implementation=68.1%), and almost all community member indicate participation in one or all Long term Planning/Education and Awareness activities (88.0%).

When analysing a possible difference between the two re-search areas, significant difference can be computed. Differences are significant concerning Education and Awareness activities ($\chi^2=20.320$; $df=1$; $p<0.001$), Management Implementation activities ($\chi^2=19.442$; $df=1$; $p<0.001$) and Environmental Planning, ($\chi^2=6.271$; $df=1$; $p<0.05$). When analysing whether this differentiation is based on a correlation and what the odds of this relationships is, correlations can be found for Education and Awareness activities (Cramer's $V=.281$; $p>0.001$; Odds Ratio=14.118; $p<0.05$), Management Implementation (Cramer's $V=.276$; $p<0.001$; Odds Ratio:3.604; $p<0.05$), and Environmental Planning (Cramer's $V=.157$; $p<0.05$; Odds Ratio=1.903; $p<0.05$).

Within Van Hung commune, significant differences can be found between the different villages. Difference are significant concerning Environmental Planning ($\chi^2=20.581$; $df=5$; $p<0.005$) and Management Implementation ($\chi^2=14.891$; $df=5$; $p<0.05$). On Cu Lao Cham significant differences can be found concerning Environmental Planning ($\chi^2=13.202$; $df=3$; $p<0.005$).

In Van Hung community a differentiation in villages can be noted based on being either sea or rural area adjacent. Concerning 'participation rate' significant differences can be noted based on this differentiation (Environmental Planning $\chi^2=6.454$; $df=1$; $p<0.05$; Management Implementation $\chi^2=5.141$; $df=1$; $p<0.05$; Education and Awareness: ($\chi^2=8.013$; $df=1$; $p<0.05$); indicating that being either sea or rural area adjacent influences the participation rate in Van Hung community.

In the Cu Lao Cham community, significant difference can be found between those villages that lie geographically clustered together and the one village that lies geographically isolated. Concerning, Environmental Planning, a significant difference can be noted between the participation rate in the cluster Thon Cam, Thon Bai Ong and Bai Lang and the cluster Bai Huong ($\chi^2=12.996$; $df=1$; $p<0.001$). This indicates that on Cu Lao Cham, the isolated village of Bai Huong did not know the same participation rate in the development phase of the project.

Decision making processes

When analysing the decision making processes at the different levels it can be noted that a significant relationship exists between the manner in which decisions are made at village level and concerning the management approach. It represents the odds ratios on decision making processes in everyday village life and within the management process. The discussion of the results is organised according to decisions being made without discussion in everyday village life (items D, E and F) and decisions being

made with discussion in everyday village life (items A, B and C). Furthermore, a comparison is made between the two re-search areas. The discussion sections will provide detailed insights in exception that occurs with item C and item E, and items 6 and 11, i.e. the influence of people with the largest income.

Decision without discussion in every-day village life

Analysis for both research areas:

No decisions made to-gather: Concerning the item 'no decisions together' in everyday village life, a significant relationship can be found with the item 'the village leader makes all the decisions without discussion' (Cramer's $V=.175$; Monte Carlo $.023<p>.031$; Fisher Exact $p>.05$) and the item 'the members of the management groups make all the decisions without discussion' (Cramer's $V=.163$; Monte Carlo $.021<p>.029$; Fisher exact $p>0.05$) concerning decisions in the management process.

The people who have the largest income make decisions without discussion

Concerning the item 'the people who have the largest income make all the decisions without discussion' in every-day village life, a significant relationship can be found with the item 'we do not make any decisions together' (Cramer's $V=.241$; Monte Carlo $.005<p>.009$; Fisher exact $p<.01$), 'the item the members of the management groups make all the decisions without discussion' (Cramer's $V=.277$; Monte Carlo $.005<p>.009$; Fisher exact $p<.01$), the item 'the village leader makes all the decisions without discussion' (Cramer's $V=.191$; Monte Carlo $.037<p>.047$; Fisher exact $p<.05$), the item 'an Non-governmental organization (NGO) makes all the decisions without discussion' (Cramer's $V=.202$; Monte Carlo $.014<p>.025$; Fisher exact $p<.05$), the item 'the government makes all decisions without discussion' (Cramer's $V=.256$; Monte Carlo $.002<p>0.005$; Fisher exact $p<.005$), and the item 'the people with the largest income have the final word' (Cramer's $V=.234$; Monte Carlo $.001<p>.003$; Fisher exact $p<0.005$) concerning decisions in the management process.

Decision being made without discussion by the village leader

Concerning the item 'the village leader makes all the decisions without discussion' in everyday village life, a significant relationship can be found with the item 'no decisions together' (Cramer's $V=.251$; Monte Carlo $.001<p>.002$; Fisher exact $p<.005$), the item 'the people who have the largest income make all the decisions without discussion' (Cramer's $V=.325$; Monte Carlo $.000<p>.001$; Fisher exact $p<.001$), the item 'the members of the management groups make all the decisions without discussion' (Cramer's $V=.283$; Monte Carlo $.000<p>.001$; Fisher exact $p<.001$), the item 'the village leader makes all the decisions without discussion' (Cramer's $V=.316$; Monte Carlo $.000<p>.001$; Fisher exact $p<.001$), the item 'an NGO makes all the decisions without discussion' (Cramer's $V=.249$; Monte Carlo $.001<p>.003$; Fisher exact $p<.005$), the item 'the government makes all decisions without discussion' (Cramer's $V=.325$; Monte Carlo $.000<p>.000$; Fisher exact $p<.001$), and the item 'the people with the largest income have the final word' (Cramer's $V=.192$; $p<0.005$; $\chi^2=8.754$; $df=1$; $p>.005$) concerning decisions in the management process (Table 3).

Table 3: Odds ratios on decision making in everyday village life and within the management approach.

Management process												
Decide together and listen to each other's opinion						Do not decide together						
Everyday village life	Final word											
	Decide together	Government	NGO	Village leader	Management groups	Largest income	Government	NGO	Village leader	Management Group	Largest income	Not any decisions together
Decide together and listen to each other's opinion												
Decide together	16,263			2,132	2,947		0,259					0,259
The village leader has the final word		5,137	6,361	4,845	2,99							
Largest income has the final word			2,46	3,263	1,878	23,485	9,286,427 *	5,089,472 *	5,143,430 *	3,513,421 *	4,839,410 *	3,563,566 *
Do not decide together												
Village leader						3,563	9,95	6,92	15,294	8,153	11,375	5,926
						0,339 *						
Largest income						8,847	10,048	7,679	8,98	12,457		7,709
						,398 *						3,657*
Not any decisions together									5,642	3,648	2,414*	

Note: NGO- Non Governmental Organization; * Odds ratio computed on the correlations and the research area.

Analysis for independent research areas

Significant relationships can be found between the manner in which decisions are made both in everyday village life and concerning the management process, and the area in which stakeholders reside. Concerning the item F 'no decision made together' in everyday village life and the item 9 'the village leader makes decisions without discussion' in the management process a significant relationship (Cramer's $V=.142$; $p<.05$; $\chi^2=4.741$; $df=1$; $p<.05$) can be found between the two research areas. Concerning the items D (the village leader makes decisions without discussion) and E (the people with the largest income make decisions without discussion), significant relationships can be found with item 6 (people with the largest income have the final word) (respectively D; Cramer's $V=.233$; $p<.005$; $\chi^2=11.711$; $df=1$; $p<.005$ and E; Cramer's $V=.186$; $p<.005$; $\chi^2= 8.210$; $df=1$; $p<.005$). Concerning item E a significant relationship can also be found with item 12 (not any decisions made together) (Cramer's $V=.170$; $p<.005$; $\chi^2=7.043$; $df=1$; $p<.005$).

Decisions with discussion in everyday village life

Analysis for both research areas: Decision being made together with the people having the largest income having the final word: Concerning the item 'those people who have the largest income have the final word' a significant relationship can be found with the item 'people who have the largest in-come have the final word' (Cramer's $V=.605$; $p<.001$; $\chi^2=87.130$; $df=1$; $p>.001$), the item 'the members of the management groups who have the final word' (Cramer's $V=.142$; $p<.05$; $\chi^2=4.883$; $df=1$; $p<.05$), the item 'the village leader has the final word' (Cramer's $V=.228$; $P<.001$; $\chi^2=12.613$; $df=1$; $p>.001$), the item 'an NGO has the final word' (Cramer's $V=.185$; $p<.005$; $\chi^2=8.276$; $df=1$; $p>.005$), the item 'the government makes all decisions without discussion' (Cramer's $V=.288$; $p<.001$; $\chi^2=19.316$; $df=1$; $p<.001$), the item 'an NGO makes all the decisions without discussion' (Cramer's $V=.271$; Monte Carlo $.001<p>.003$; Fisher Exact $p<.005$), the item 'the village leader makes decisions without discussion' (Cramer's $V=.163$; Monte Carlo $.021<p>.029$; Fisher Exact $p<.021$), the item 'the members of the management groups make decisions without discussion' (Cramer's $V=.171$; $p<.05$; $\chi^2=7.025$; $df=1$; $p<.05$), the item 'the people who have the largest make decisions without discussion' (Cramer's $V=.192$; Monte Carlo $.004<p>.007$; Fisher Exact $p<.05$), the item 'no decisions made together' (Cramer's $V=.202$; $p<.05$; $\chi^2=9.833$; $df=1$; $p<.005$) concerning decisions in the management process.

Decisions together with village leader having the final word

Concerning the item 'the village leader who have the final word' a significant relationship can be found with the item 'the members of the management groups who have the final word' (Cramer's $V=.236$; $p<.001$; $\chi^2=13.478$; $df=1$; $p<.001$), the item 'the village leader has the final word' (Cramer's $V=.345$; $p<.001$; $\chi^2=29.003$; $df=1$; $p<.001$), the item 'an NGO has the final word' (Cramer's $V=.400$; $p<.001$; $\chi^2=39.078$; $df=1$; $p<.001$), the item 'the government that has the final word' (Cramer's $V=.322$; $p<.001$; $\chi^2=25.335$; $df=1$; $p<.001$) concerning decisions in the man-agreement process.

Decisions together: Concerning the item 'decide together' a significant relationship can be found with the item 'the members of the management groups who have the final word' (Cramer's $V=.172$; $p<.05$; $\chi^2=7.187$; $df=1$; $p<.05$), the item 'the village leader who has the final word' (Cramer's $V=.128$; $p<.05$; $\chi^2=4.034$; $df=1$; $p<.05$), the item 'decision together' (Cramer's $V=.425$; Monte Carlo $.000<p>.000$; Fisher Exact $p<.001$), the item 'the government makes all the decisions without discussion' (Cramer's $V=.172$; Monte

Carlo $.017<p>.024$; Fisher Exact $p<.05$), the item 'the people who have the largest income make all the decisions without discussion' (Cramer's $V=.158$; Monte Carlo $.028<p>.037$) concerning decisions in the management process.

Analysis for independent research areas

Concerning item C (those people that have the largest income have the final word) and the items 7 through 12 significant relationships between the two research areas can be found; 'the government makes decisions without discussion' (Cramer's $V=.184$; $p<.05$; $\chi^2=7.836$; Decision Factor: $df=1$; $p<.05$), 'an NGO makes decisions without discussion' (Cramer's $V=.165$; $p<.05$; $\chi^2=6.337$; $df=1$; $p<.05$), 'the village leader makes decisions without discussion' (Cramer's $V=.188$; $p<.05$; $\chi^2= 8.185$; $df=1$; $p<.05$), ' the management groups make decisions without discussion' (Cramer's $V=.192$; $p<.05$; $\chi^2= 8.796$; $df=1$; $p<.05$), 'the people with the largest income make decisions without discussion' (Cramer's $V=.127$; $p<.05$; $\chi^2= 9.398$; $df=1$; $p<.05$), 'not any decision being made together' (Cramer's $V=.127$; $p<.05$; $\chi^2=3.898$; $df=1$; $p<.05$)

DISCUSSION

The analysis of participation and knowledge sharing is based on the hypothesis that both participation and knowledge sharing are prerequisites for Integrated Coastal Zone Management. This is supported both in theory and in practice [17]. An epistemological view on social-ecological systems analysis shows that a knowledge-based strategy to systematically address complex problems allows for the study of ecological and societal processes at different dimensions and scales, from local to global [18]. The usage of multiple knowledge systems, such as scientific, indigenous, traditional ecological, local, and practitioner knowledge, are beneficial in terms of the insights provided from such knowledge systems and in terms of the usage of participation as a means for empowering local resources users, and the challenges and trade-offs involved in using such processes [19].

Participation rate

Research in Integrated Coastal Zone Management implies the need for stakeholder participation both in the development phase and the implementation phase, analogue with the change in theory and practice on participation from solely consultation to co-decision making [20-22].

When stakeholder participation is examined in Vietnam, it can be noted that concerning activities in the development phase of Integrated Coastal Zone Management (ICZM), the participation rate is relatively low compared to that in the implementation phase, although more than half of local stakeholders is involved. This development phase is consistent with the factor 'Environmental Planning activities' that has a participation rate of 56.0%. Local stakeholders' participation rate in Management Implementation activities, such as patrol groups is slightly higher with 68.1%. The participation rate of these activities is influenced by the necessity of participation as only a previously defined number of stakeholders can be part of these groups. A participation rate of 88.0% for Education and Awareness activities implies that almost all members of the researched communities participate in one or more activities. Previous research in Vietnam on participation in fishery management shows similar participation rates [7]. A possible explanatory factor for this high participation rate is trust in fishery management leaders as a relationship between both indicates that as the level of trust in leadership increases, the participation rate increases accordingly [7].

When analysing the participation rate between the two areas, it can be noted that significant differences exist concerning 'Education and Awareness activities' and concerning 'Management Implementation activities'. Concerning 'Education and Awareness activities', more stakeholders in Van Hung commune indicate not to participate (20.3%) than stakeholders who reside on Cu Lao Cham (1.8%). For those stakeholders who do participate, the participation between the two regions is similar (Van Hung=50.7%; Cu Lao Cham=49.3%), indicating that the difference in participation rate should be found in the reasons as to why stakeholders do not participate in these activities. This differentiation is even more apparent concerning 'Management Implementation activities'; in Van Hung commune the participation rate of those that do participate is 56.3%, whereas on Cu Lao Cham, the participation rate is 82.3%. Concerning Environmental Planning activities, the participation rate is more balanced; with a participation of 49.0% in Van Hung commune and 64.6% on Cu Lao Cham. When analysed whether or not this difference is based on a correlation between the two variables, it can be noted that a small correlations can be found between the area in which you live and the participation rate. When the Odds Ratio for these correlations are computed it needs to be noted that the odds of not participating in Education and Awareness Activities in Van Hung commune is about 14 times as likely to occur than on Cu Lao Cham. The odds for not participating in 'Management Implementation activities' and 'Environmental Planning activities' are lower than those concerning 'Long term planning/Education and Awareness activities'; indicating that the region in which stakeholders reside influences their odds of participation less for 'Management Implementation' and 'Environmental Planning activities' than for 'Long term planning/Education and Awareness activities'.

When analysing differences in participation rate within Van Hung commune, it is apparent that being either sea or rural area adjacent influences whether or not stakeholders participate. The participation rates in those villages that are sea adjacent are significantly higher than for those villages that are rural area adjacent. On Cu Lao Cham however no significant difference exist between the cluster Thon Cam, Thon Bai Ong and Bai Lang and the isolate village of Bai Huong concerning 'Management Implementation activities' and 'Education and Awareness activities'. Concerning 'Environmental Planning' a significant difference could be found between the cluster and the isolated village, indicating that the Bai Huong village did not know the same participation rate in the development phase of the management approach.

The differentiation between being either rural area adjacent or sea adjacent is an expression of village organisation according to "Van Chai". A "van" is described as a group of fishers' families that share kinship, or live in the same geographical area, a "Van Chai" is a "Van" that uses the same type of fishing gear, i.e. "Chai" [23]. The existence of these "Van Chai" is used as an example to analyse the influence of context in Integrated Coastal Zone Management. "Van Chai" even though currently not recognised from a legislative viewpoint, influencing such matters as fishing rights allocation, is considered an influential factor in fishery management approaches [7,23]. The cultural legacy of "van" is still present in everyday village life in fishing communities in Vietnam and is expressed in regards to respect for elders, trust in the known and distrust in the unknown [7].

When analysis on the participation rate is conducted at village level, significant difference can only be found for 'Environmental

Planning' and 'Management Implementation'; indicating that at village level no differentiation can be found for 'Education and Awareness activities'. This indicates that participation in these types of activities does not depend on the village in which one lives, indicating that village members have the same odds to participate independent of their village. Concerning 'Management implementation', differentiations at village level can only be determined within Van Hung commune; indicating that only in Van Hung commune the village in which one resided influences the participation rate. Concerning 'Environmental Planning', significant differences can be found between the various villages in both areas, indicating that the village in which one lives does influence the participation rate in the development phase.

Overall it can be stated that the participation rate differs dependent on the place in which one resides. The degree to which and the activities for which differs depending on the level on which one defines 'place of residence'. The more local one defines place of residence, in descending order being: areas, separate areas, cluster level, and village level, the less likely it is that the place of residence influences the participation rate. The exception being activities in the development phase, for which differences can be found on all levels, indicating the even within community, or a cluster within this community, whether or not one participates depends on the village in which one resides. Furthermore, as a difference exists between the two re-search areas concerning the level on which significant differences can be found, the area in which one resides does not only influence the participation rate itself, but also the level to which this difference exists. In laymen's terms this indicates that in Van Hung commune the differences between the villages are more apparent than on Cu Lao Cham. Very little research has been conducted in Vietnam on actual participation rates within a coastal management framework. The research by Ho (2015) being the exception usable for comparison with this research. The case study approach used in the research by Ho (2015) is predominantly based on fishing gear types or "Van Chai". The opportunity for the research on Cu Lao Cham and in Van Hung to be compared to that of Ho (2015) lies in the community organisation in the two research areas based on this "Van Chai", with the residents of one village using a similar or the same fishing gear. This type of community organisation also provides a possible explanation as to why differentiation exists between the two research areas and within these areas. As in Van Hung commune one cluster is rural area adjacent the community organisation influences the occurrence of villages being organised around fishing gear. This explains why more apparent differentiation can be found between the villages in Van Hung commune than on Cu Lao Cham, as villages, especially in the rural area adjacent cluster are less rigorously defined based on fishing gear as they are on Cu Lao Cham. These differences in village organisation and the subsequent differences in participation rate imply that the context of the area in which stakeholders reside influence this participation rate.

Decision making

The analysis on decision making processes is made to determine whether the context of the coastal zone in which Integrated Coastal Zone Management is applied needs to be taken into account when applying a participatory approach. From this analysis, no conclusions will be made as to whether or not decisions are made in a participatory or non-participatory manner, as it is not the aim of this research to determine on the one hand the level of participation or on the other hand draw conclusions on the

validity of this participation. The analysis will therefore not make deductions concerning the current state of decision making in the research areas, it will however provide insight into whether or not the decision making process in everyday village life influences the decision making process in the management process.

When decision making process are analysed in both Van Hung commune and on Cu Lao Cham archipelago, both in everyday village life and in the management process a differentiation can be noted between those decisions that are made with discussion and those that are made without discussion; with the exception of the influence that people with a large income have. Comparison between this analysis and previous research on participation in Integrated Coastal Zone Management, indicates that a pattern of participatory and non-participatory processes emerge [21]. Specifically, it can be noted that those items that fall in the category participatory processes (i.e. Items A through C) in everyday village life, correlate mostly with items that fall in the category participatory processes (i.e. items 1 through 6) in the management process. The exception here being that item C (People with the largest income having the final word) correlate additionally with all items in the non-participatory category (i.e. item 7 through 12) in the management process. Concerning non-participatory processes in everyday village life (i.e. items D through F) correlation can be found with non-participatory processes in the management process. The exception for these categories being the correlation with item 6 (deciding together with the people with the largest income having the final word) and items D (Village leader decides) and E (People with the largest income decide).

These correlations indicate that significant relationships exist between the manner in which decisions are made in everyday village life and the manner in which decisions are made in the management process.

Decisions without discussion in everyday village life

In order to determine exactly how likely it is that whether or not a certain decision making process in everyday village life occurs affects whether or not a certain decision making process in the management process occurs, odds ratios are computed. For example the odds of 'the village leader not making decisions without discussion' in the management process, when decisions are not made together in village life is 5 times as likely to occur then when in everyday village life decisions are made together (Odds ratio=5.462; $p<0.05$). In laymen's terms this indicates that when decisions are not made together in everyday village life it is 5 times as likely that a village leader makes decisions without discussion in the management process. When this is translated to participation theories, it can be deduced that when community members do not participate in the decision making process in everyday village life, it is more likely that a village leader will make the decisions in the management process without allowing local community members to participate in the decision making process then when these community members do participate in the decision making process in everyday village life. This indicates that none-to-limited participation in decision making processes in everyday village life influences the decision making processes in Integrated Coastal Zone Management; specifically this indicates that the decision making context of communities influences the decision making process of Integrated Coastal Zone Management.

Furthermore, it can be noted that decision being made without discussion in everyday village life only influence decisions being made without discussion in the management process. This indicates

that when decisions are made without discussion within everyday village life the likelihood of decision being made with discussion in the management process is not affected, neither in a positive nor a negative manner. The exception being that for those decisions made with discussion with the people with the largest income having the final word. The odds of the people with the largest income having the final word in the management process is 3.5 times as likely to occur when the village leader makes all the decisions, then when the village leader does not make all the decisions. The same conclusion can be drawn for the people with the largest income making all the decisions in everyday village life. The odds of them having the final word in the management process, is about 9 times as likely to occur when they make all the decisions in everyday village life, then when they do not make all the decisions in everyday village life (Odds Ratio=8.847; $p<0.05$; Fisher exact >0.05). This exception indicates that having financial power in everyday life does not only increase the likelihood of this financial power influencing the decision making process in the management process when there is no discussion (i.e. non-participatory) but also when there is discussion (i.e. participatory).

Decisions with discussion in everyday village life

For decisions being made with discussion in everyday village life, odds ratios are computed in the same manner. As was the case for decision being made without discussion; for decision being made with discussion the manner in which decisions are made in everyday life with discussion influences the manner in which decisions are made in the management process. For example the odds of decisions being made together in the management process, when decisions are made together in everyday village life are 16 times more likely to occur then when no decisions are made together in everyday village life (Odds Ratio=16.263; $p<0.05$). This indicates that when in everyday village life community members participate in the decision making process, it is 16 times more likely they will also participate in the decision making process in Integrated Coastal Zone Management. The same deduction can be made as for decisions being made without discussion; the decision making context of communities influences the decision making process in Integrated Coastal Zone Management.

As it was the case for decision being made without discussion, decision being made with discussion in everyday village life mostly influence decisions being made with discussion in the management process? The differentiation between participatory and non-participatory processes is however not straightforward. When the odds for 'people who have the largest income having the final word' are analysed, it can be seen that this likelihood does increase the likelihood for other stakeholders to make decisions without discussion. As this is only the case for people who have the largest income and not for other forms of power (such as being a village leader), the possibility exist that having financial power influences the decision making process more than having any other kind of power. Furthermore, the influence of this financial power in everyday day village life when a participatory process occurs, not only influences, within the management process, this same financial power, but also other forms of power such as political power by the government, non-governmental power by NGO's and less institutional political power such as village leadership.

Whereas it was the case for non-participatory processes that no correlation could be found between 'not making any decisions together' (i.e. items F and 12), for participatory process a significant correlation can be found for 'decisions being made together' (i.e.

Items A and 1). Even though a relationship can be found between items F and 12, it is not deemed statistically significant, indicating that the possibility of this relationship being based on chance is too high to draw any conclusions. This could indicate that the possibility that participatory process influence other participatory processes is higher than the possibility that non-participatory processes influence non-participatory processes in their extreme. This deduction can however not be made when a comparison is made for the other items within each category; a differentiation in absolute numbers exists, but the differentiation in relationships is non-existent, extremely small or contradictory. The only case in which a participatory process decreases the odds of a non-participatory process from occur is for item A, 'decisions being made together', and item 7 and 11. Specifically this indicates that the odds for either the government or the people with the largest income making all decisions in the management process are less likely to occur when decisions are made together in every day village, then when decisions are not made together.

Comparison between two research areas

When a comparison is made between two areas in Vietnam, it can be noted that the likelihood of whether a not a certain decision making process occurs in everyday village life affects whether or not a certain decision making process occurs in the management process, can differ for both regions. The differentiation between the two regions is only present for non-participatory process, either in the management process or in everyday village life. When decisions are made together in everyday village life, a differentiation between the two regions can only be noted concerning decisions being made in everyday village life by the people having the largest income having the final word. For example the odds of the government not making decisions without discussion in the management process, when those people who have the largest income do not have the final word in everyday village life is less likely to occur in Van Hung commune then on Cu Lao Cham (Odds Ratio=.427; $p < 0.05$). The differentiation shows that the likelihood of financial power having influence on the decision making process is larger in Van Hung commune then on Cu Lao Cham. Indicating the decision making context in Van Hung commune differs from that on Cu Lao Cham; specifically that in Van Hung commune it is more likely that having financial power influences the decision making process than on Cu Lao Cham.

In general the likelihood of non-participatory processes in everyday village life positively influencing (i.e. making it more likely) the likelihood of non-participatory process in the management process is more likely in Van Hung commune then on Cu Lao Cham. There is however one exception: the odds of the village leader not making decisions without discussion when decision are made together in everyday village life, is 2.5 time as likely to occur in Van Hung then on Cu Lao Cham (Odds ratio=2.414; $p < 0.05$). Indicating that the influence of a non-participatory process (i.e. not any decisions made together) is more likely to negatively (making it less likely) influence the likelihood of a non-participatory process in the management process in Van Hung commune then on Cu Lao Cham when it concerns the odds of the village leader making decisions without discussion.

From these odds ratios it can derived that the context of coastal zones influences the decision making process in Integrated Coastal Zone Management. This context however also differs between regions, both having a different influence on the management

process; indicating that not only coastal zones have different contexts, but this context also has a different influence on decision making process.

Van Chai and decision making processes

The Vietnamese proverb 'Phep vua thua le lang' loosely translated into 'the King's rule stops at the village gate' is an expression of how village life and decision making processes are organised in Vietnam. This system of decentralised power is however not completely straightforward and the long history of Vietnam and its many occupiers have influenced the organisation of village life [24]. "Van Chai" in this regards is an expression of how the members of these "van" do not fully comprehend or know the regulations of the central Vietnamese power (government), but have a strong adherence to customs and rules of their respective "van" or communities [23,25]. The influence of these "Van Chai" on the decisions making process is therefore one that cannot be dismissed. Without a full analysis of the specific organisation of these "Van Chai" in the two re-searched areas, it can be noted, as was the case for 'participation rate' that differentiation in decisions making processes can be found based on the village and community organisation in accordance with these "Van Chai". The more rigorous organisation of village according to "Van Chai" on Cu Lao Cham, and the less rigorous organisation according to "Van Chai" in Van Hung commune explicate why differences occur both within and between the two research areas [26]. "Van Chai" however does not explain the exception of the influence of financial power.

Limitations

It is imperative to note that the analysis on decision making processes does not allow for generalisation. Whereas influence of context can be determine within and between these regions, does not indicate that context influences Integrated Coastal Zone Management within and beyond the borders of Vietnam. No deductions can be made whether or not and to what degree context can or does influence Integrated Coastal Zone Management beyond the borders of these two research areas. This in itself is due to the nature that context influence context, making it not possible to generalise outcomes. As a recommendation, it is suggested that generalisation is not attempted for the determination of the influence of context on Integrated Coastal Zone Management. Research, whether for scientific or management purposes should always be placed in the context in which it exists.

CONCLUSION

The influence of context in Integrated Coastal Zone Management can be determined on a local level concerning participation rate, community organisation and decision making. Fishery communities are unique in Vietnam in that sense that they know a tradition of "Van Chai"; a tradition that entails a significant cultural legacy of trust and respect. The influence of this Van Chai as expressed in the analyses on participation rate is a clear example as to how a coastal zone's context influences Integrated Coastal Zone Management. This reasoning is extended to decision making processes, an expression of both participatory processes and management. The analysis of decisions making processes reveals that the manner in which decisions are made in everyday village life influences the manner in which decisions are made in the management process. "Van Chai" is within this regards considered as an analogue explanatory factor as it was for participation rate.

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The deduction that Van Chai are an explanatory factor as to why Integrated Coastal Zone Management is influenced by the context in which it is applied and thereby the understanding that Integrated Coastal Zone Management should be adapted to this context, explicates that working within social-ecological systems not only requires an ecological perspective, but also a social and cultural framing of these systems. (Word Style "TA_Main_Text"). For full instructions, please see the journal's Instructions for Authors. Do not modify the font in this or any other section, as doing so will not give an accurate estimate of the formatting for publication and final length of the paper.

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