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MEASURING SOCIAL VULNERABILITY AND ADAPTIVE CAPACITY TO CLIMATE CHANGE IN DOMINICAN REPUBLIC COASTAL COMMUNITIES

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MEASURING SOCIAL VULNERABILITY AND ADAPTIVE CAPACITY TO CLIMATE CHANGE IN DOMINICAN REPUBLIC COASTAL COMMUNITIES

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ABSTRACT

People's capacity to adapt to shifting and emerging climate conditions is one of the most important characteristics to consider when addressing climate risks. This study explores the vulnerability and adaptive capacity to changing climate conditions of individuals in various sectors of employment in three coastal communities of the Dominican Republic. Participants included individuals who directly use marine resources for their occupation and those who do not. Specific research questions in this study are: What are the factors related to adaptive capacity in coastal communities of the Dominican Republic? Do these factors vary between direct resource users and non-direct resource users? Do these factors vary amongst individuals who do and do not share household responsibility for income?

Principal component analysis of responses to 26 likert statements resulted in seven factors related to occupational adaptive capacity: *ability to plan, learn, and reorganize; attachment to occupation; occupational adaptability/flexibility; attachment to place; employment security; financial security;* and *occupational mobility.* Factor scores were compared between direct resource users and non-direct resource users, as well as between individuals who are the sole providers of household income and those who share the responsibility of providing income to the home, to explore if there is a difference in vulnerability and adaptive capacity between these groups of coastal residents. Results suggest that responses to many of the factors related to vulnerability and adaptive capacity are similar for all coastal

individuals. However, direct resource users displayed greater attachment to occupation and sole providers of household income exhibited lower financial security. This research has important implications for community and development planners, emphasizing the value of understanding a person's role in a household to better anticipate an individual's ability and willingness to make changes related to occupation.

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PREFACE

This preface is to inform the reader of this thesis that it has been written in Manuscript Format. All the pages have been formatted in the accepted font and margin alignment. This manuscript is prepared for submission to *Society and Natural Resources.*

Table of Contents

List of **Figures**

List of Tables

Manuscript- I

To be submitted for publication in *Society and Natural Resources*

Vulnerability and Adaptive Capacity in Coastal Communities of the Dominican Republic

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Introduction

Recent research suggests that people's capacity to adapt to shifting and emerging climate conditions may be the most important characteristic when addressing climate risks (Dixit et al., 2012). In particular, the capacity of natural resource-dependent communities to adapt to unavoidable climate impacts requires immediate attention because global changes in climate patterns and events are altering the accessibility, quality, and availability of natural resources. This leads to extensive impacts on the social and economic systems they support (Marshall, 2011).

Increasingly, studies about resource-reliant populations focus on coastal communities of the tropics (Bailey & Pomeroy, 1996; Adger, 2000; Folke, 2006; Costanza et al., 1995). The livelihoods of individuals in these communities are diverse and vary in the degree to which they depend on natural resources. Enterprises that rely directly on ecosystem goods and services are highly vulnerable to impacts of climate change (Zamani et al., 2006). Ultimately, though, all coastal social systems depend on healthy and functional ecosystems to be productive (Adger, 2000). Therefore risks to the resilience of these socio-ecological systems must be understood and reflected in practical, effective, and adaptive community planning.

Impacts of climate variability include increased storm intensity, ecosystem degradation, and cultural change due to increased use of technology (e.g. advanced boat engines, fishing gear, GPS) ((Marshall et al., 2010). Climate-driven changes have altered marine resource regulations and management as well, such as

permitting fewer days at sea due to poor weather conditions. These climatic stressors may also catalyze non-climate dependent drivers of economic, environmental, institutional, cultural and political pressures (Marshall et al., 2010; Nelson et al., 2007). For instance, more frequent foul weather that keeps fishing and tourism vessels from leaving port can create tension between the regulating authorities and boat operators. The combination of stresses makes socio-ecological changes inevitable.

To sustain communities challenged with unknown levels of change, it is important to identify aspects of vulnerability, or susceptibility to impacts of change, and take actions to enhance the ability to adapt, or cope with, such changes (Marshall, et al., 2010, Cinner et al., 2009; Gunderson et al, 2002). This can help local, regional, and national leaders to develop policies that are feasible and practical for the community or communities of interest (Smit & Wandel, 2006). This study examines the vulnerability and adaptive capacity of individuals living in coastal communities in the Dominican Republic.

Vulnerability and adaptive capacity related to climate change

Vulnerability is the susceptibility of an individual within a system or community to disturbances caused by exposure to perturbations, sensitivity to perturbations, and the capacity to adapt to such perturbations (Nelson et al., 2007). Exposure refers to the degree to which a community or resource incurs changes in climate (Marshall et al., 2010). In many parts of the Caribbean and the tropics in general, exposure to increased sea surface temperatures and more frequent storms

of high intensity can threaten the integrity of coral reef ecosystems (Kushner et al., 2012). Sensitivity describes the degree to which a system or community is affected by and responds to changes in climate (Marshall et al., 2010). For instance, the extent to which individuals whose livelihoods occur on the sea, like fishers and tour operators, are affected by regulations prohibiting vessels to leave port, and thus prohibiting work, in foul weather.

Adaptive capacity is the third factor that affects vulnerability, and is argued to be the factor most effectively addressed by policy (Dixit et al., 2012; Marshall et al., 2010). According to much of the climate change literature, adaptive capacity describes the ability to respond to changes in a system through learning, managing risk and impacts, accruing new knowledge and developing effective management plans (Marshall et al., 2010; Caffrey et al., 2013). The capacity of individuals to cope and adapt to climate variability is determined by their circumstances, characteristics, and the ability to take advantage of other opportunities (Marshall et al., 2010).

Resilience is inversely related to vulnerability. Social resilience, therefore, is the flexibility with which an individual or system can cope and adapt to changes in climate, resource availability and access (Marshall & Marshall, 2007; Nelson et al., 2007).

Measuring Vulnerability and Adaptive Capacity

There are multiple methods for assessing vulnerability and adaptive capacity. Theoretical contributions to such studies are derived from a combination

of social, ecological, and psychological perspectives (Folke, 2006; Adger, 2000; Berkes & Ross, 2013). Indicators have been established to measure vulnerability and adaptive capacity at many levels, from national (e.g. Brooks et al., 2005) to community (e.g. Magis, 2010; Berkes & Ross, 2013) to household (e.g. Cinner et al., 2011) and individual (e.g. Marshall & Marshall, 2007).

Besides exposure and sensitivity, social capital can affect people's vulnerability and adaptive capacity. Social capital is the intangible resources (e.g., ideas, information) that individuals access via relationships with others (Grootaert, 2004). The nature and extent of one's formal and informal networks greatly affects the ability to cope with change (Grootaert, 2004; Magis, 2010; Marshall et al., 2010; Berkes & Ross, 2013).

This study adapts the Marshall et al. (2010) method for assessing social vulnerability and adaptive capacity. This method is itself a modified version of that which was used in a study of Australian fishers (Marshall & Marshall 2007). This method has been adapted for multiple related studies of individual community member's vulnerability to climate change in tropical, coastal communities (e.g., Cinner et al., 2009; Cinner et al., 2011; Shaffril et al., 2013).

Indicators used to measure adaptive capacity in this framework fall into four categories: perception of risk associated with potential change; perception of ability to plan, learn, and reorganize; perception of ability to cope with change; and level of interest in change (Marshall & Marshall, 2007; Marshall et al., 2010). These indicator categories include specific measures related to attachment to occupation, attachment to place, employability, family characteristics, formal and

informal networks, and financial status (Marshall et al., 2010). For instance, an individual's financial situation, ability to secure alternative employment, and ability to remain competitive within a current occupation are used to measure one's perception of risk, which relates to one's management of risk (Marshall & Marshall, 2007).

Recent research on impacts of climate variability to individuals in resource dependent groups has focused primarily on individuals whose livelihood is based on the abundance and health of certain natural resources (e.g., Cinner et al., 2009; Marshall et al., 2010). Few studies have examined individuals with livelihoods that indirectly rely on natural resources via functional ecosystem goods and services.

Occupational Multiplicity and Diversity

The complexity of coastal socio-ecological systems in the tropics can complicate the assessment of vulnerability related to livelihoods. Individuals in these communities often take advantage of multiple available resources, decreasing the dependence on any one particular resource or livelihood (Bailey & Pomeroy, 1996). An individual or household that participates in more than one livelihood activity is considered to exhibit occupational multiplicity (Daw et al., 2012; Cinner et al, 2008). A related phenomenon is occupational diversity, which is the "maintenance and continuous adaptation of a highly diverse portfolio of activities in order to secure survival that is a distinguishing feature of rural livelihood strategies in contemporary poor countries" (Ellis, 2000, p. 290). Individuals and households that undertake multiple, diverse livelihoods including

some degree of fishing is often seen in coastal communities of the tropics (Pollnac et al., 2001; Daw et al., 2012; Cinner et al., 2008), and is important when considering how individuals within these communities will respond to change.

Furthermore, occupational multiplicity has been shown to affect one's willingness to leave a risky occupation, such as fishing (Daw et al., 2012; Cinner et al., 2008). An individual with more than one occupation, or an employed individual living in a household where others have occupations as well, is able to spread the risks associated with decreased productivity or total loss of one particular livelihood. That is, an individual who is solely responsible for providing income to a household assumes more responsibility, and thus more risk, if s/he decides to leave his/her occupation and take a chance with another. A study in Madagascar that assessed the adaptive capacity of individuals whose primary livelihood was in fisheries used an adapted version of the method used in Marshall & Marshall (2007). This study found that the extent to which alternative livelihood opportunities are available is an indicator of flexibility, or resilience, within a community (Cinner et al., 2009).

Vulnerability and adaptive capacity in coastal Dominican Republic

This study examines vulnerability and adaptive capacity of individuals in coastal communities of a Caribbean nation that is experiencing socio-ecological changes of both climate and non-climate origin. The Dominican Republic is an ideal location to investigate the vulnerability and adaptive capacity of individuals in coastal communities because many of its coastal communities are highly

dependent on the health of coastal habitats to sustain major livelihoods of fishing and tourism and mitigate the effects of potential and frequently more probable natural disasters, such as flooding and storm surge (Caffrey et al., 2013). Furthermore, the Dominican Republic was recently listed as one the most at-risk developing nations for impacts from climate change (Hallegatte et al., 2013).

This study expands the population of interest to both direct marine resource users and non-direct resource users, or individuals with occupations not directly related to marine resources. Individuals with livelihoods based in both user groups depend on a healthy, functional social-ecological coastal system for a resilient lifestyle and community.

This study uses a modified version of the Marshall et al. (2010) framework to explore the vulnerability and adaptive capacity of both direct and non-direct resource users to climate variability in coastal communities of the Dominican Republic. Specific research questions examined in this study include: What are the factors related to adaptive capacity in coastal communities of the Dominican Republic? Do these factors vary between direct resource users and non-direct resource users? Do these factors vary amongst individuals who do and do not exhibit household occupational multiplicity?

Methodology

Study area: Dominican Republic

This study applied several of the indicators from Marshall et al.'s (2010) vulnerability assessment method to the coastal communities of La Caleta/Boca Chica, Samana, and Montecristi in the Dominican Republic during June and July of 2014 (Figure 1). The Caribbean nation of Dominican Republic rests on the eastern two-thirds of the island of Hispaniola, with Haiti neighboring on the western third of the island. The 2010 National Census reported a population of approximately ten million people and unemployment of about 13 percent. The unemployment rate for young people is 30 percent (Caffrey et al., 2013). Close to 70 percent of the national population live in urban areas, which can marginalize and further increase the vulnerability of rural populations, such as those studied along the coasts (Caffrey et al., 2013).

Figure 1 Map of the Dominican Republic, with the three study site communities highlighted. (Source: Destination 360)

While the World Bank classifies the Dominican Republic as an upper middle-income country, the nation suffers severe inequality in income distribution as more than 40 percent of its people live at or below the poverty line (Caffrey et al., 2013). A majority of the residents in the study sites suffer from income inequality and poverty, with some representation of the poorest ten percent of the population (Caffrey et al., 2013). USAID (2013) characterized Samana and Montecristi, as well as rural areas surrounding Santo Domingo (like La Caleta/Boca Chica), as communities with vulnerable individuals of low socio-economic status and limited formal education.

All individuals living and working in Dominican coastal communities are at risk to climate change stressors like intense rainfall events and associated flood risk, less specific rainy and dry seasons, degraded beaches and fish spawning

areas, and sea level rise (Caffrey et al., 2013). These threats are coupled with non-climatic stressors like unchecked sedimentation and pollution from the land and alterations to the natural drainage system due to land-based development.

Three study communities

La Caleta/Boca Chica

The municipality of Boca Chica, within which lies the district of La Caleta, is a 140.9 sq km region on the central southern coast, east of the nation's capital city Santo Domingo. The population in 2010 was 142,019 residents, with an eight percent unemployment rate (ONE, 2010). Occupational reliance on coastal resources here is high. Coastal tourism is popular in the area, and many residents rely on this industry, including recreational watersports and fishing, for employment.

Samana

Samana lies at the peninsular mouth of Samana Bay, on the central northern coast of the country. The municipality is 410.8 sq km in size, has a population of 58,156 residents, and an unemployment rate of 11 percent (ONE, 2010). A majority of residents rely on fisheries and agriculture for livelihoods, with up to three-quarters of the population involved in informal agriculture of plants and livestock and approximately 9,000 formal and informal fishers (Caffrey et al., 2013). Also important for the area's livelihoods are businesses associated with tourism, including the service industry and real estate.

Montecristi

Montecristi is on the northern, westernmost coast of the nation, bordered by the Atlantic Ocean to the north and the neighboring nation of Haiti to the west. The municipality is 517.4 sq km in size and has approximately 24,644 inhabitants, with an unemployment rate of 6.8 percent (ONE, 2010). Montecristi is particularly vulnerable to long periods without regular rainfall, and has been suffering a debilitating drought that has left many farmers without work for three consecutive years since 2011. Common livelihoods here are fishing and salt harvesting, along with a nascent tourism sector.

Data Collection

This study used the individual person as the main unit of analysis. Since vulnerability and resilience can be measured at many scales, studying individuals and households of individuals that collectively make up larger social groups (communities, societies, etc.) provides information that can be useful to understand policy and development issues at community, regional, or national scales (Marshall et al., 2010; Adger, 2000).

Consultations with national actors, such as natural resource managers and climate and environmental policymakers, were held to identify the specific communities to include in this study. The communities of La Caleta/Boca Chica, Samana, and Montecristi were chosen because these communities are characterized by high resource dependence (a large number of individuals participating in marine resource-dependent livelihoods) and high exposure to threats from climate change. Discussions with at least one relevant stakeholder at

each study site were held prior to survey implementation to find out best times and places to encounter representatives of a variety of occupations within the municipality.

Structured face-to-face surveys were conducted with community members living in La Caleta and Boca Chica, Samana, and Montecristi. Structured surveys provide a relatively straightforward approach to studying attitudes, values, beliefs and motives. They are adaptable to collect generalizable information from a variety of human populations and allow for large amounts of collected data to be standardized and analyzed (Robson, 2011). Community members participating in the surveys included non-direct resource users as well as direct resource users, the latter being the only population of interest in previous uses of Marshall et al.'s (2010) method. In this study, individuals who interact directly with natural resources for a living (e.g., fishers, tour and transportation operators) are considered to be *direct resource users*, while individuals who rely on direct resource dependents and other residents of a community for a living (e.g., restaurateurs, shop keepers, mechanics) are considered *non-direct resource users*.

The survey was implemented using purposive sampling at multiple local locations and at various times of day for two weeks at each site. Purposive sampling relies on the researcher's judgment and interest to build a sample that satisfies the specific needs of the project (Robson, 2011). In this way, locations that were sure to provide encounters with direct resource users and/or non-direct resource users were chosen to maximize the number of surveys collected in a community in a short amount of time. Sampling sites included the local waterfront,

beaches, fishers' landing and distribution sites, domino parks and the downtown business area of each municipality. There are no official estimates of the population of Dominican Republic resource users, so purposive sampling in a wide variety of sites allowed for a diverse array of resource users to be included in this study.

Survey Instrument

The survey contained three sections (Appendix A). The first section collected demographic information from the participant. This included age, gender, primary occupation, level of formal education, number of years in the community, number of individuals living in the household, number of occupations of the participant and number of occupations in the participants' household. The second section was composed of 26 likert scale statements adapted from Marshall et al.'s (2010) study. These statements were developed to quantify the level of social, economic, and environmental dependency of the participant (Marshall et al., 2010). This section asked participants to rate their level of agreement on a 4-point likert scale (1=strongly disagree to 4=strongly agree) with statements regarding the perception of risk; capacity to plan, learn, reorganize and cope; and level of interest in adapting to change (Marshall & Marshall, 2007). The four-point scale was used to discourage ambiguous responses of neutrality (Marshall, 2011). The third section of the survey included thirteen statements related to an individual's environmental awareness and preferences. This final section also included three statements about the degree to which, on a 4–point likert scale (1= strongly disagree to 4 = strongly agree), the participant had observed changes in climate (e.g., rainfall, temperature, storms) in the past ten years or less and

whether such changes have affected their work. Participants were encouraged to provide more detailed, qualitative responses to these questions as well.

The survey was translated into Spanish and previewed by several Dominican research experts in order to maximize the effectiveness of the language used. The survey was piloted in Puerto Plata, a coastal community with several conditions in common with the communities of interest including the prevalence of tourism and fishing for local livelihoods. Responses to pilot surveys benefit a study by ensuring that the vocabulary and concepts introduced in the survey were understandable and elicited the intended thoughts and considerations from the participants (Robson, 2011). After the pilot implementation, further revisions to the specific language used in the survey were made before implementation in the study sites. All surveys were conducted by one person, which eliminated the possibility of between-researcher bias in the ranking of responses and ensured that all questions were asked in the same way during data collection (Robson, 2011).

Data Analysis

Principal component analysis with varimax rotation and Kaiser normalization (PCA) was conducted in order to reduce the large number of variables to a few factors that constitute meaningful categories related to social vulnerability and adaptive capacity. Standardized factor scores were computed using Bartlett's method in SPSS v.20 for each group of statements. These were compared among different groups of coastal individuals based on resource use in occupation, number of livelihoods undertaken by the participant, and number of occupations present in the participants' household (Table 1).

Table 1 Terms used to define participant groups.

Term	Description	Example
Resource User: Direct	individual who interacts directly with natural resources for a living	fishers, fish sellers, tour and transportation operators
Resource User: Non-direct	individual who relies on direct users and others in a community for a living	restaurateurs, shop keepers, hospitality staff
Livelihood: Single	individual who only participates in one income-generating livelihood	participant with only one occupation (fisher; shop clerk)
Livelihood: Multiple	direct resource user who participates in more than one income-generating livelihood	participant who fishes and drives a motorbike taxi for livelihoods
Provider: Sole	individual in a household with no other income-providing individuals	participant whose income supports an entire household
Provider: Shared	individual in a household with other income-providing individuals	participant whose income is supplemented by others to support a household

First, factor scores were compared between direct resource users and non-direct resource users using a t-test to determine if there was a difference in vulnerability and adaptive capacity between these groups of coastal residents. T-tests were also conducted to assess the vulnerability and adaptive capacity in the context of occupational multiplicity. Factor scores of individuals with a single

livelihood were compared to those of individuals with multiple livelihoods, and factor scores for individuals who were sole providers of household income were compared to individuals who were shared providers of household income. Significance for all statistical tests was determined at the commonly accepted 5% level.

Finally, responses to questions from section three of the survey about changes in climate and weather in the past ten years were analyzed to explore perceived changes. Qualitative responses from participants regarding the type of change(s) they have noted were coded and counted. Coding creates clusters, or categories, of similar responses by different participants to be counted and analyzed (Miles et al., 2014). Six categories emerged from the responses: rainfall, temperature, seasonality, wind, storms, and sea level rise. The number of times each type of climate change was mentioned by respondents was counted. Some respondents mentioned more than one type of change, and some respondents mentioned no change at all.

Results

A total of 175 surveys were conducted. This sample included 90 direct resource user participants and 85 non-direct resource user participants, 97 participants with one livelihood and 78 with multiple livelihoods, and 85 participants who were sole providers of household income and 90 participants who shared household income responsibilities (Table 2). Overall, characteristics between participant groups were relatively similar. Across all groups, the average age across groups ranged from 37-41 years old while the age of all participants ranged from 18 to 71. The mean number of years of formal education ranged from 9-11 years, and the individual's mean household size was between three and four persons. All participants had on average between one and three employed persons in their household, and approximately two dependent, or unemployed, persons per household.

Table 2 Demographic information collected from study participants.

Variable	Non-direct resource users		Direct resource users		Single livelihood		Multiple livelihoods		Sole provider		Shared provider	
	(N=85)		*(N=90)*		*(N=97)*		*(N=78)*		*(N=85)*		*(N=90)*	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*
Age	38.6	13.6	39.9	13.7	38.3	14	40.5	13.2	40.8	13.7	37.8	13.6
No. years of formal education	11.2	4	9.1	3.9	10.8	4.1	9.1	3.9	9	4	11	3.9
No. years living in community	26.4	15.4	32	18	26.6	16.1	32.4	17.5	30.6	16.6	27.9	17.2
No. people in household	3.9	2.2	3.8	2.1	3.8	2.2	3.8	2	3.2	1.9	4.4	2.2
No. employed people in household	1.9	1.1	1.6	0.8	1.8	1.1	1.7	0.8	1	0	2.4	0.9
No. dependents in household	1.9	2	2.2	1.9	2.1	2	2.1	1.9	2.2	1.9	1.9	2
Community: La Caleta/ Boca Chica	27*		27*		33*		21*		23*		31*	
Community: Samana	31*		30*		29*		26*		25*		36*	
Community: Montecristi	27*		33*		35*		31*		37*		23*	
	* number of participants per community											

Factors that characterize vulnerability and adaptive capacity

A rotated component matrix presented nine factors that have an eigenvalue greater than one (Appendix B). Together, these factors explained 60% of the total variance. Statements with loadings equal to or above the absolute value of 0.50 are considered to be a strong influence on a factor (Table 3). An analysis of the scree plot led to the removal of factors 8 and 9 because the plot line levels off after factor 7. (Appendix C). The seven factors that remained were identified as follows: *ability to plan, learn, and reorganize; attachment to occupation; occupational adaptability/flexibility; attachment to place; employment security; financial security; and occupational mobility*. While this is a relatively high number of factors, all seven have practical significance to the study and were therefore retained for further analysis.

Table 3 Seven factors emerged from a principal component analysis of 26 likert statements. The factors are listed here, with the composite statements that had a loading with an absolute value of 0.50 or higher.

Factor	Statements	Loading	Percent of Total Variance Explained
Ability to plan, learn, reorganize	I am confident that my skills will mean that I am successful in my job.	0.554	**17%**
	I can cope with small changes in my job.	0.653	
	Every time there is a change, I plan a way to make it work for me.	0.699	
	I am more likely to adapt to change compared to others I know.	0.596	
Attachment to occupation	I cannot imagine myself in any other occupation.	0.689	**9%**
	I love my job.	0.529	
	My occupation is more than a job-it is a lifestyle.	0.505	
	It is a waste of my skills to get a job elsewhere.	0.721	
Occupational adaptability/ flexibility	I would like to start a business one day doing something other than what I do now.	0.613	**7%**
	I always get professional advice before making any business decision.	0.691	
Attachment to place	I feel like I belong to this community.	0.824	**6%**
	The friendships I have with people in this community mean a lot to me.	0.733	
	I plan to be a resident of this community for many years.	0.531	
Employment security	I have many options available to me other than my current primary occupation.	0.647	**4%**
	I have many options available to me if I decide to leave my job.	0.739	

Financial security	If there are any more changes I will not survive in this job much longer.	0.777	**4%**
	I have some good ideas about how to ensure the sustainability of my job.	0.594	
Occupational mobility	I would be nervous trying something other than what I do now for work.	-0.833	**4%**

Comparing Direct and Non-direct Marine Resource Users

After identifying the factors that relate to social vulnerability and adaptive capacity of the participating individuals in coastal Dominican Republic communities, means of each of the seven component scores were compared between all direct resource users and non-direct resource users (Table 4).

Factor scores for direct and non-direct resource users differed significantly for one factor, *Attachment to Occupation.* Direct resource users scored higher (M=0.230, SD=1.02) than non-direct resource users (M=-.0243, SD=0.927), t(173)= -3.22, p=0.002.

Table 4 Results of t-test comparing the mean component scores of non-direct resource users and direct resource users for the seven factors of vulnerability and adaptive capacity. Equal variances not assumed for the means. (bold indicates significant difference)

Factor	Non-direct Resource Users (N=85)		Direct Resource Users (N=90)		t	df	p-value
	Mean	SD	Mean	SD			
Ability to plan, learn, reorganize	0.096	0.887	-0.091	1.093	1.25	169	0.214
Attachment to occupation	**-0.243**	**0.927**	**0.23**	**1.017**	**-3.22**	**173**	**0.002**
Occupational adaptability/flexibility	-0.143	0.988	0.135	0.998	-1.85	173	0.066
Attachment to place	0.069	0.987	-0.065	1.014	0.89	173	0.378
Employment security	-0.049	0.999	0.047	1.004	-0.63	173	0.527
Financial security	0.092	0.898	-0.087	1.085	1.19	170	0.235
Occupational mobility	-0.04	0.972	0.038	1.029	-0.52	173	0.604

Comparing individuals with and without occupational multiplicity

There were no significant differences in vulnerability and adaptive capacity between participants with a single livelihood and those with multiple livelihoods (Appendix D).

Mean factor scores were compared for participants who are sole providers in their households and participants who are shared providers in their households (Table 5). Individuals who were sole providers in their households scored significantly lower (M=-0.158, SD=0.932) on *Financial Security* as compared to individuals who were shared providers in their households (M=0.149, SD=1.043), t(172)= -0.205, p=0.041. This result suggests that individuals who are the only ones in their household with an occupation are less able to plan and save for the

future, which may make them more vulnerable and affect their willingness to make changes, such as those associated with occupation.

Table 5 Results of t-test comparing the mean component scores of participants who are sole providers and participants who are shared providers for the seven factors of vulnerability and adaptive capacity. Equal variances not assumed for the means. (bold indicates significant difference)

Factor	Sole provider of household income (N=85)		Shared provider of household income (N=90)		t	df	p-value
	Mean	SD	Mean	SD			
Ability to plan, learn, reorganize	-0.037	1.081	0.035	0.921	-0.472	165	0.638
Attachment to occupation	0.018	1.02	-0.017	0.987	0.234	172	0.815
Occupational adaptability/ flexibility	-0.15	1.106	0.141	0.871	-1.925	160	0.056
Attachment to place	0.057	0.961	-0.054	1.038	0.738	173	0.462
Employment security	0.001	1.089	-0.001	0.914	0.013	164	0.990
Financial security	**-0.158**	**0.932**	**0.149**	**1.043**	**-0.205**	**172**	**0.041**
Occupational mobility	-0.066	1.021	0.063	0.981	-0.853	171	0.395

Changes in climate and weather

Finally, yes or no responses from participants regarding changes in climate and weather events in the past ten years or less were counted to determine coastal residents' perceived changes in climate (Table 6). By asking about specific changes in climate events (e.g., rainfall, storms) and climate patterns (e.g., rainy

season), these results further explore the different effects of climate change for direct and non-direct resource users. Results show that a majority of participants from both direct and non-direct resource user groups (159 of 175, or 91%) have noticed changes in weather conditions. Direct resource users felt that these changes affected their work more than non-direct resource users (64% and 24% respectively), and 81% of participants from both user groups (142 of 175) are concerned about climate changes in the future.

Table 6 Responses from participants regarding perceived changes in weather and climate in recent past.

Statement	Non-direct resource users (N=85)				Direct resource users (N=90)				All Participants (N=175)			
	No	Percent	Yes	Percent	No	Percent	Yes	Percent	No	Percent	Yes	Percent
I have noticed changes in weather conditions over the past ten or less years.	9	11%	76	89%	7	8%	83	92%	16	9%	159	91%
Changes in typical weather conditions have affected my work.	65	76%	20	24%	32	36%	58	64%	97	55%	78	45%
I am concerned about changes in weather conditions in the future.	21	25%	64	75%	12	13%	78	87%	33	19%	142	81%

Qualitative responses from participants regarding the type of change(s) they have noticed were coded and counted for seasonality, temperature, rain, wind, storms, and sea level rise (Table 7). Overall, 73 participants (42%) said that the seasons had changed in the recent past; that is, the rainy season was less predictable and reliable than it used to be. Over half of participants (57%) noted changes in temperature and many participants (56%) noted changes in the rainfall. Twenty-six participants (15%) mentioned changes in the wind, and twenty participants (11%) acknowledged changes in storms.

Table 7 Total number and percentage of participants who mentioned specific climate and weather-related changes in the recent past (ten years or less).

Type of climate change	**Non-direct resource users (N=85)**		**Direct resource users (N=90)**		**All Participants (N=175)**	
	Total	**Percentage**	**Total**	**Percentage**	**Total**	**Percentage**
Changes in seasons	34	**40%**	39	**43%**	**73**	**42%**
Changes in temperature	54	**64%**	45	**50%**	**99**	**57%**
Changes in rainfall	44	**52%**	54	**60%**	**98**	**56%**
Changes in wind	8	**9%**	18	**20%**	**26**	**15%**
Changes in storms	8	**9%**	12	**13%**	**20**	**11%**
Sea level rise	3	**4%**	3	**3%**	**6**	**3%**

Perceived changes in climate and weather

Most study participants acknowledged that there have been changes in climate within the past ten years. They observed changes in rainfall, temperature,

seasons, wind, storms, and sea level rise. With regard to rainfall, many individuals commented that there is less rainfall than there used to be. Many individuals surveyed commented that the rainfall events of the rainy season (roughly May-July) to which they are accustomed are no longer predictable or reliable. There is less rain during this season than in the past, but more frequently now there are rainy events during other times of the year.

Temperatures are said to have risen, in general and also specifically in the summer. Many participants shared negative comments about the hot and dry summers they experience now compared to the past, when they used to have rains that brought relief from the heat.

About a third of participants commented that the seasons, which are typically distinguished by moderate changes in temperature and serious changes in rainfall, are no longer predictable. A common remark was that it rains when it shouldn't (if and when it rains at all) and it is hotter than it should be, in the summer season in particular. Many of the direct resource users and a handful of non-direct resource users also commented that it is windier than it used to be, and that storms are more intense. Changes in wind and storms were of greatest concern to direct resource users, many of whom were concerned because the frequency of heavy winds and foul weather in general prohibits them from leaving port to fish. Six participants noted sea level rise.

Discussion

Factors of vulnerability and adaptive capacity

This study found seven different factors related to vulnerability and adaptive capacity in coastal residents of the Dominican Republic: *ability to plan, learn, and reorganize; attachment to occupation; occupational adaptability/flexibility; attachment to place; employment security; financial security; and occupational mobility*. Some of these factors are similar to those that have been found in comparable studies using Marshall et al.'s (2010) survey questions, including *attachment to occupation* and *attachment to place* (Marshall, 2011). The *ability to plan, learn, and reorganize* and *financial security* factors are captured in other studies, but with a slightly different representation of only two or three statements each (Marshall & Marshall, 2007; Marshall et al., 2010).

Marshall et al.'s (2010) study found a single factor referred to as Employability, which in this study is captured in several different factors, such as *Occupational adaptability/flexibility, Occupational mobility,* and *Employment security*. It is possible that employability did not emerge as one single factor because the occupations considered in this study are broader than those in other studies that used a similar method to focus on a single employment sector, such as grazers or fishers (Marshall, 2011; Marshall & Marshall, 2007).

The division of employability found in this study is useful to separately measure an individual's interest (*occupational adaptability/flexibility*), willingness (*occupational mobility*), and preparedness (*employment security*) to adapt to changes because a change of occupation out of necessity is not the same as change due to choice (Ellis, 2000). For instance, a person may have an interest in change

but feel that they are in a financial or social situation that discourages such action. This type of circumstance is quite different than a person who, regardless of personal interests, considers change of occupation to be required. This could be caused, for example, by a loss in employment (e.g., fired from a job), a change in access rights (e.g., loss of hunting or fishing license) or changes in costs and fees they are unable, not just unwilling, to meet.

Comparing vulnerability across user groups

The only significant difference between direct and non-direct users was that direct marine resource users were more likely to be attached to their occupation, which is a common finding in studies that focus on resource-dependent groups around the world (e.g., Cinner et al., 2008; Shaffril et al., 2012; Pollnac et al., 2001). This indicator of vulnerability, characterized by a low level of interest in changing occupation, often presents a serious challenge to the suitability and success of attempts to introduce alternative livelihoods that reduce pressure on natural resources (Cinner et al., 2008; Shaffril et al., 2012; Pollnac et al., 2001). Greater attachment to occupation usually means less interest in changing location and livelihood, which threatens an individual's ability to provide for themselves and others when climate variability and/or limitations to resource availability reduce the productivity of and income from one's work (Shaffril et al., 2012).

Direct resource users were also more likely than non-direct users to note that changes in climate conditions, specifically wind and storms, affected their

ability to work. When the weather is foul and winds are strong, the Dominican Navy prohibits vessels from leaving port. Stronger winds and stronger storms reduce the productivity of direct resource users by limiting their ability to conduct work on the sea. For a group of individuals who are not interested in changing occupation, reduced productivity may make them more vulnerable.

It should be noted, however, that only one of seven factors characterizing vulnerability and adaptive capacity showed a significant difference between direct and non-direct resource users. Within the scope of this study, results imply that direct resource users and non-direct resource users in coastal communities of the Dominican Republic share many of the same characteristics of vulnerability and adaptive capacity. This finding suggests that it is important to consider the vulnerability and adaptive capacity of all stakeholders because climate change will have impacts that affect the occupations of many people within a community, not just isolated groups of resource-dependent people.

Exploring how occupation relates to vulnerability

There are many dimensions of occupation that have been studied in relation to preparedness for climate change. One particular dimension is occupational multiplicity, or the participation of an individual or household in more than one livelihood. This study explored occupational multiplicity in terms of the numbers of jobs held by an individual (single/multiple livelihoods) and by a household (sole/shared providers). Participants in this study who were shared providers to household income displayed higher *financial security* (confidence in one's savings

and job security, and awareness of possible economic impacts stemming from potential changes) than those who were sole providers of household income. Individuals who are sole providers might feel less willing to take risks, such as a change in occupation, because of a lack of alternative or supplementary sources of income in the home. Shared providers may feel more willing and able to consider risky decisions, like making changes related to occupation, because they do not feel as individually responsible for household financial security and well-being.

That shared providers for household income may be more equipped to take risks, such as those related to employment, is consistent with other studies of occupational diversification. For instance, fishers in the Pacific and Indian Oceans were more likely to be willing to stop fishing when they lived in households that had multiple occupations (Daw et al., 2012; Cinner et al., 2008). This suggests that an individual's occupation is just one part of a broader network of income and resource sharing within households. Therefore, the factors that influence whether an individual will be willing and able to make changes may be better understood if viewed through a wider lens that considers an individual's connections to others in their household, family or broader social network.

Distinguishing between changes made by choice and those made out of necessity may also provide greater insight into the motivations and reasoning for an individual's decision to make a change. For example, an individual who used to fish but is now trying to make a living as a mechanic might have done so by choice because fishing became less beneficial (e.g., less fish are caught but costs to go out are the same or higher). However, s/he also might have done so out of necessity,

without having a choice, because fishing ceased to be an option (e.g., loss of fishing license due to stringent regulation changes; income from fishing no longer meets requirements for rent and children's school fees). These different circumstances may lead to a similar outcome but conclusions about the reason for the change (e.g., willingness and interest in doing it) may not be clear.

Management Implications

This study provides valuable insight for local officials, practitioners and researchers interested in vulnerability and adaptive capacity to climate change in coastal communities of the Dominican Republic and beyond. Direct and non-direct resource users tended to share similar vulnerabilities. Community planners and local officials working to prepare coastal areas for impacts of climate change should consider these similarities and expand outreach projects and development plans beyond the immediately vulnerable sectors (e.g., fishing, tourism) to better prepare the community as an integrated network of employed individuals facing similar issues.

This study found that both direct resource users and individuals who are sole providers of income for their household are particularly vulnerable groups of individuals. These individuals have the lowest interest in change and have less financial security to buffer them from the risks of a change in occupation. In consideration of the increased vulnerability in terms of attachment to occupation of direct resource users compared to non-direct users, attempts to introduce or expand alternative options (e.g., livelihoods, education and/or training) may be better

received by individuals who have not yet entered, or are not yet fully integrated into, a resource-dependent occupation.

This recommendation is supported by the findings of a job satisfaction study in Southeast Asia, which found that fishers were not interested in changing their livelihoods nor interested in their children becoming fishers (Pollnac et al., 2001). Rather than spending time, money, and energy trying to change the occupation-often considered a way of life- of people who are not interested in such a change, it may be more advisable to aim the often limited resources of alternative opportunities at those who have yet to come in to a livelihood.

Furthermore, practitioners should consider working beyond the unit of individuals, to ensure that entire households are financially secure. While Marshall et al.'s (2010) framework for assessing social vulnerability and adaptive capacity has primarily focused on the characteristics of an individual, the findings from this study indicate that characteristics of an individual's household, such as the number of jobs in a household, can influence adaptive capacity. This suggests that planners and managers could work toward increasing overall employment levels in households within a community rather than focusing employment efforts on individuals who are working in vulnerable sectors. For example, a community that promotes and/or offers incentives for households to seek employment for more than one person can increase financial security at the household level. Also, offering small loans to individuals, especially direct resource users, who commit to a new and/or alternative livelihood can help compensate for the income that the individual and their household may lose during a time of occupational transition.

A study measuring the success of microfinance programs in vulnerable, rural communities in India supports this recommendation. Eighteen months after providing loans to certain households, these families were more likely to have started a business and to consume less while investing more to ensure the success of their business (Banerjee& Duflo 2011, p. 171). This suggests that providing a small financial safety net to jumpstart new, alternative occupational initiatives and buffer from the risk of financial collapse or debt may make a big difference to households who are interested in, but unable to, make changes in livelihoods. Other studies have also found that social development (e.g., training and education) must be integrated with economic development (e.g., job creation, microfinance, market access) in order to sustain coastal communities with vulnerable livelihoods (Pomeroy et al., 2006). The importance of financial security to the willingness and ability of an individual to make changes should be incorporated into development projects in vulnerable coastal communities, especially for individuals who are sole providers of income.

This study also supports recent findings that point to a lack of public knowledge and awareness in the Dominican Republic regarding climate change impacts specific to the sea (Tejada et al., 2014). Many of the concerns voiced by this study's participants about changes in climate were related to public health and terrestrial resource management, and marine-related issues were less frequently mentioned, if at all. For example, most participants who noted less rain and hotter temperatures felt these changes were detrimental to agricultural productivity. Environmental concerns about the ocean were rare, with only six participants

mentioning sea level rise, and only two individuals, who were involved in scuba diving businesses, mentioning declining coral reef health.

This notable lack of awareness and concern for the ocean among Dominican citizens was confirmed through conversations with more than one Dominican resource manager and environmental policy expert. Many professionals involved in environmental conservation and climate change in the Dominican Republic seem to agree that there is greater professional capacity, research, and education related to the terrestrial environment compared to the marine environment. This seems surprising for an island nation whose economy depends on its coral reefs and coastal beaches for tourism and fisheries, yet whose reefs are losing productivity and beaches are eroding (Wielgus et al., 2010). The high level of reliance on coastal and marine resources, coupled with an overall low level of awareness, calls for more resources and initiatives devoted to marine-focused research, education, and awareness for the public from local to national scales. A greater understanding of all possible impacts of climate change to the environment, and specifically the threats to livelihoods that depend on healthy marine resources like fishing and tourism, may lead to greater public concern for the potential consequences and increase support for adaptation and mitigation efforts.

Future Research

There are several opportunities for extending the current research study. For instance, Marshall et al.'s (2010) survey questions could be supplemented with a section that explicitly asks for information about an individual's household employment circumstances. Assessing the perceived level of shared responsibility, and perhaps the level of risk faced by others in the household, would provide greater insight into the capacity and willingness of individuals to make changes and take risks. Also, further research to better understand why direct resource users are so attached to their occupations would help to identify other, less vulnerable jobs that offer similar benefits to those they experience now and therefore may be more successful as lasting alternatives.

Future studies would also benefit from a more careful consideration of gender, as there was a notable lack of female participants in this study. There are fewer women in the Dominican Republic who work as direct marine resource users than men, but the bias toward male perspective should be noted and considered with regard to the accuracy of comparing the responses of direct (mostly male) and non-direct (male and female) resource users. A more even distribution of males and females, or a sample population specific to one gender, should be considered for future studies.

Conclusion

This study provides new information about the vulnerability and adaptive capacity of individuals in coastal communities of the Dominican Republic. Results suggest that direct resource users and non-direct resource users share many of the same characteristics of vulnerability and adaptive capacity, such as the *ability to plan, learn, and reorganize; occupational adaptability/flexibility; attachment to place; employment security; financial security; and occupational mobility.*

Direct resource users were found to have a greater *attachment to occupation* compared to non-direct resource users. This finding has been reported in other studies of direct resource users around the world, and may have important implications for practitioners interested in developing alternative livelihood opportunities, especially within a direct resource-using sector of employment. Individuals who have yet to enter a livelihood may better receive alternative occupation opportunities, and further research should be aimed at better understanding the reason for such strong attachment to these occupations.

Sole providers of household income in this study displayed lower *financial security* compared to individuals who shared income responsibilities with others in the home. Local officials and practitioners in development and aid projects would benefit from considering these results when deciding how to direct loans and related microfinance funds, as individuals may be more able to cope with changes that affect their occupation if they have a financial buffer to protect them and the rest of their household from the risks of lost income when making a transition in employment. Results also point to the need for a deeper understanding of an

individual's role in a household to better understand their ability and willingness to make changes.

Finally, this study adds a new case to the global conversation on the adaptive capacity of vulnerable coastal communities of the tropics. Together with the USAID (2013) report that assesses institutional and national preparedness, this study provides a valuable assessment of Dominican social vulnerability and adaptive capacity to climate change.

Appendix A

Survey of Adaptive Capacity measures
Estudio de las medidas de la capacidad de adaptación

Survey Site:	**Date:**	**Time of day:**
Lugar del estudio:	Fecha:	Hora del día:

(A) Background information: Please answer with the most accurate answer.
(A) Antecedentes: Por favor, conteste con la respuesta más precisa.

1. Age:
Edad:
2. Gender:
Sexo:
3. Number of years of formal education:
Número de años de educación formal:
4. Marital status:
estado civil
5. Number of years living in this community:
Número de años ya viviendo en esta comunidad
6. Number of years working in this community:
Número de años ya trabajando en esta comunidad:
7. Are you involved in any community organizations? How many?
¿Participa en alguna de las organizaciones de la comunidad? Cuantos?

8. Number of people in your household:
Número de personas en su hogar:
9. Number of people in household earning income:
Número de personas en su hogar obteniendo ingresos:
10. Number of dependents:
número de dependientes:

11. Percentage of household income coming from occupation(s) that utilize natural resources:
Porcentaje de ingresos del hogar obtenido a partir de la(s) ocupación(es) que utilizan los recursos naturales:

0	less than half	more than half	all
0	menos de la mitad	más de la mitad	todo

12. Percentage of household income received from a person(s) not living with you:
Porcentaje de ingresos del hogar obtenido a partir de una(s) persona(s) que no viven con usted:

0	less than half	more than half	all
0	menos de la mitad	más de la mitad	todo

13. Percentage of household income provided to a person(s) not living with you:
Porcentaje de ingresos del hogar proporcionado a una(s) persona(s) que no viven con usted:

0	less than half	more than half
0	menos de la mitad	más de la mitad

14. What is your primary occupation?
¿Cuál es su principal ocupación?

15. Do you work for other people (are you an employee)?
¿Usted trabaja para otras personas (es usted un empleado)?

16. What else do you do for work? Please list in order of importance.
¿Qué otras cosas hace usted para el trabajo? Por favor, enumere en orden de importancia.

17. What else do people in your household do for work? Please list in order of importance.
¿Qué más hace la gente en su hogar por trabajo?
Por favor, enumere en orden de importancia.

(B) Please indicate your level of agreement with following statements.
1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree
(B) Por favor, indique su nivel de acuerdo con las siguientes declaraciones.
1= muy en desacuerdo, 2= desacuerdo, 3= de acuerdo, 4= muy de acuerdo

18. I have many options available to me other than my current primary occupation.
Tengo muchas opciones disponibles para mí aparte de mi actual ocupación principal.
1 2 3 4

19. I am confident that my skills will mean that I am successful in my job.
Estoy seguro de que mis habilidades se significa que voy a tener éxito en mi trabajo.
1 2 3 4

20. I can cope with small changes in my job.
Puedo enfrentarse/hacer frente a pequeños cambios en mi trabajo.
1 2 3 4

21. There are too many other people in the area who do what I do for a living.
Hay demasiadas otras personas en el área que hago lo que hago para ganarme la vida.
1 2 3 4

22. I do not think I am competitive enough to survive in my job much longer.
Creo que no soy lo suficientemente competitivo para sobrevivir en mi trabajo por mucho más tiempo.
1 2 3 4

23. I am confident that I could get work elsewhere if I needed to.
Estoy seguro de que podría conseguir trabajo en otro lugar si lo necesitase.
1 2 3 4

24. If there are any more changes I will not survive much longer.
Si hay más cambios que no sobrevivirá mucho tiempo más.
1 2 3 4

25. I am interested in learning new skills outside of my current primary occupation.
Estoy interesado en el aprendizaje de nuevas habilidades fuera de mi actual ocupación principal.
1 2 3 4

26. I would be nervous trying something other than what I do now.
Yo estaría nervioso intentando algo distinto de lo que hago ahora.
1 2 3 4

27. I am continually monitoring the social and ecological conditions around me.
Estoy continuamente monitoreando las condiciones sociales y ecológicas a mi alrededor.
1 2 3 4

28. I have planned for my financial security.
He planeado para mi seguridad financiera.
1 2 3 4

29. Every time there is a change, I plan a way to make it work for me.
Cada vez que hay un cambio, tengo pensado una manera de hacer que funcione para mí.
1 2 3 4

30. I am more likely to adapt to change compared to other friends I have.
Yo soy más probabilidades de adaptarse a los cambios en comparación con otros amigos que tengo.
1 2 3 4

31. I always have an amount of cash available for emergencies.
Siempre tengo una cantidad de dinero disponible para emergencias.
1 2 3 4

32. I have some good ideas about how to ensure the sustainability of my job.
Tengo algunas buenas ideas sobre la manera de garantizar la sostenibilidad de mi trabajo.
1 2 3 4

33. I cannot imagine myself in any other occupation.
No me puedo imaginar a mí mismo en cualquier otra ocupación.
1 2 3 4

34. I love my job.
Me encanta mi trabajo.
1 2 3 4

35. I would like to start a business one day doing something other than what I do now.
Me gustaría empezar un negocio una día en algo distinto de lo que hago ahora.
1 2 3 4

36. The occupation I have now is a lifestyle- it is not just my job.
La ocupación que tengo ahora es un estilo de vida no es sólo mi trabajo.
1 2 3 4

37. I have many options available to me if I decide to leave my job.
Tengo muchas opciones disponibles para mí si me decide a dejar mi trabajo.
1 2 3 4

38. It is a waste of my skills to get a job elsewhere.
Es una pérdida de mis habilidades para conseguir un trabajo en otro lugar.
1 2 3 4

39. I feel like I belong to this community.
Siento que pertenezco a esta comunidad.
1 2 3 4

40. The friendships I have with people in this community mean a lot to me.
Las amistades que tengo con la gente de esta comunidad significan mucho para mí.
1 2 3 4

41. I plan to be a resident of this community for many years.
Tengo la intención de ser un residente de esta comunidad por muchos años.
1 2 3 4

42. I have strong ties to people in other communities.
Tengo fuertes lazos con gente de otras comunidades.
1 2 3 4

43. I always get professional advice before making any business decision.
Siempre me dan consejo/asesoramiento profesional antes de tomar cualquier decisión de negocios.
1 2 3 4

44. We must take care of land & sea resources or they will not be available in the future.
Hay que tener cuidado de los recursos de la tierra y del mar si no van a estar disponibles en el futuro.
1 2 3 4

45. If our community works together then we will be able to protect our resources.
Si nuestra comunidad trabaja en conjunto entonces seremos capaces de proteger nuestros recursos.
1 2 3 4

46. Farming and other land uses far from the coastline cause harm to the sea.
La agricultura y otros usos de la tierra lejos de la costa causa un daño al mar.
1 2 3 4

47. If we throw garbage on the beach, the ocean takes it away and it causes no harm.
Si tiramos basura en la playa, el mar se la quita y que no causa ningún daño.
1 2 3 4

48. There are so many fish in the sea that no matter how many we catch, there will always be enough for our needs.
Hay tantos peces en el mar que no importa cuántos cogemos, siempre habrá suficiente para nuestras necesidades.
1 2 3 4

49. Human activities do not affect the number of fish in the sea.
Las actividades humanas no afectan el número de peces en el mar.
1 2 3 4

50. Protecting coastal and sea areas is important for the health of the sea in the future.
La protección de las zonas costeras y marinas es importante para la salud del mar en el futuro.
1 2 3 4

51. Closing areas of the sea to fishing is an effective way to protect fish resources.
Áreas del mar cerrado a la pesca es una forma eficaz de proteger los recursos pesqueros.
1 2 3 4

52. More areas of the sea should be off limits to fishing.
Más áreas del mar deberían ser prohibidas para la pesca.
1 2 3 4

53. More areas of the sea should be off limits to all uses.
Más áreas del mar deben ser fuera de límites para todos los usos.
1 2 3 4

54. More areas of the sea should be off limits to tourist activities.
Más áreas del mar deben ser fuera del alcance de las actividades turísticas.
1 2 3 4

55. I have noticed changes in weather conditions over the past ten years.
Me he dado cuenta de los cambios en las condiciones climáticas/del tiempo en los últimos diez años.
1 2 3 4
What changes have you noticed?
¿Qué cambios ha notado?

56. Changes in typical weather conditions have affected my work.
Los cambios en las condiciones climáticas/del tiempo típicas han afectado a mi trabajo.
1 2 3 4
How?
¿Cómo?

57. Changes in typical weather conditions have affected my household's income.
Los cambios en las condiciones climáticas/del tiempo típicas han afectado a mi los ingresos del hogar.
1 2 3 4
How?
¿Cómo?

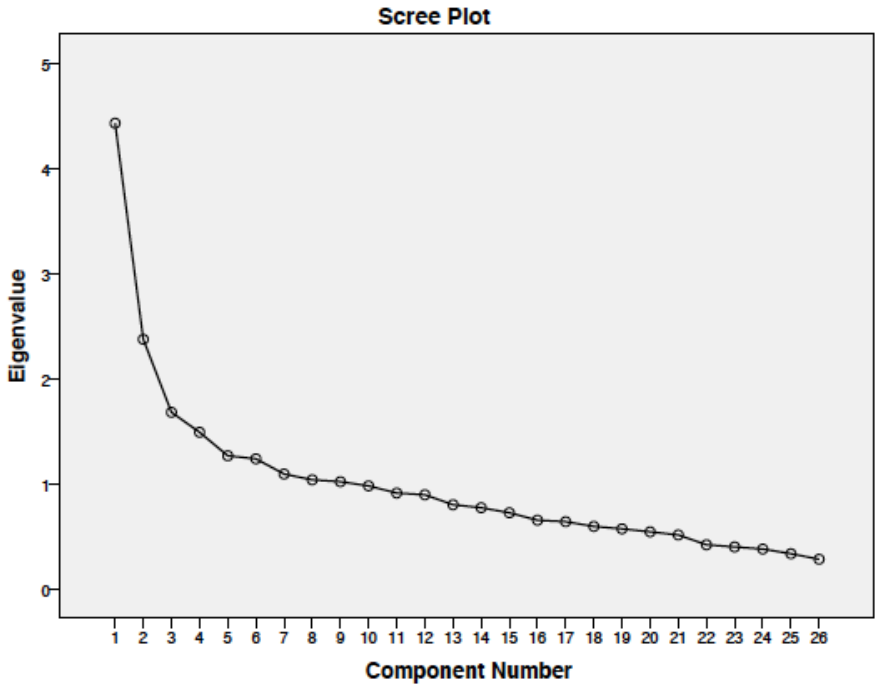
58. I am concerned about changes in weather conditions in the future.
Estoy preocupado por los cambios en las condiciones climáticas/del tiempo en el futuro.
1 2 3 4
How?
¿Cómo?

Appendix B

Rotated Component Matrix[a]

	Component							
	1	2	3	4	5	6	7	8
MQ18					.647			
MQ19	.554							
MQ20	.653							
MQ21								
MQ22								.666
MQ23			.375				.390	
MQ24						-.777		
MQ25	.356		.461					
MQ26							-.833	
MQ27	.419							
MQ28	.375				.380	.422		
MQ29	.699							
MQ30	.596		.384					
MQ31						.353	.463	-.390
MQ32						.594		.407
MQ33		.689						
MQ34		.529						
MQ35			.613					
MQ36		.505						
MQ37					.739			
MQ38		.721						
MQ39				.824				
MQ40				.733				
MQ41		.461		.531				
MQ42			.467				.448	
MQ43			.691					

Appendix C


Scree Plot
Eigenvalue
0
1
2
3
4
5
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
Component Number

Appendix D

Factor	Single Occupation (N=97)		Multiple Occupations (N=78)		t	df	p-value
	Mean	SD	Mean	SD			
Ability to plan, learn, reorganize	0.11	0.941	-0.137	1.059	1.62	155	0.108
Attachment to occupation	-0.03	0.996	0.038	1.01	-0.45	164	0.657
Occupational adaptability/ flexibility	-0.005	1.097	0.006	0.872	-0.07	173	0.944
Attachment to place	-0.107	1.054	0.134	0.917	-1.62	172	0.108
Employment security	0.032	0.996	-0.04	1.009	0.48	164	0.636
Financial security	-0.094	1.1	0.117	0.851	-1.43	173	0.155
Occupational mobility	0.02	0.995	-0.251	1.012	0.3	164	0.767
equal variances not assumed							

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