

**CLIMATE CHANGE VULNERABILITY ASSESSMENTS IN SELECTED COASTAL
COMMUNITIES IN KENYA**

21-UNITED NATIONS ENVIRONMENT PROGRAMME-158828-CONSULTANT

CONTRACT FOR THE SERVICES OF CONSULTANT OR INDIVIDUAL CONTRACTOR

CONTRACT NO.: 2500279467

INCEPTION REPORT

PREPARED BY

DR. JACOB OCHIEWO, PhD
KENYA MARINE AND FISHERIES RESEARCH INSTITUTE (KMFRI)
P.O. BOX 81651-80100 MOMBASA, KENYA
E-mail: jacobochiewo@gmail.com; jacobochiewo@yahoo.com

SUBMITTED TO

UNEP - NAIROBI CONVENTION SECRETARIAT WIOSAP

8th November 2021

1.0 Introduction

The Nairobi Convention Secretariat within the Ecosystems Division of UNEP, is implementing projects entitled 'Implementation of the Strategic Action Programme for the protection of the Western Indian Ocean from land-based sources and activities' (WIOSAP) with funding from the Global Environment Facility (GEF) and the Partnership project between the Nairobi Convention and the South West Indian Ocean Fisheries Commission (NC-SWIOFC PP) for marine and coastal governance and fisheries management for sustainable blue growth with funding from the Swedish International Development Cooperation Agency (SIDA). On the one hand, the WIOSAP project is implementing interventions 'to reduce impacts from land-based sources and activities and sustainably manage critical coastal and marine ecosystems through the implementation of the agreed WIO-SAP priorities with the support of partnerships at national and regional level. It has presented an opportunity to the governments in the region and their conservation partners to jointly implement strategies of protecting coastal and marine ecosystems from land-based sources and activities to sustainably provide essential goods and services. On the other hand, the NC-SWIOFC partnership project seeks (i) to enhance the resilience of livelihoods based on WIO marine and coastal ecosystem and habitats, (ii) to promote sustainable management of coastal fisheries using the ecosystem approach to fisheries, and (iii) to enhance coordination between fisheries and environmental management institutions. Component 1 of the project on environmental management will support regional and national capacity on adaptation to climate variability and change. It will address the capacity gap on options, approaches, and tools for the sustainable management of the use of coastal resources, particularly fisheries and assessment of risks and vulnerabilities affecting coastal fisheries communities.

Implementation of these two projects will support regional collaboration for enhancing scientific research, data generation, assessment and analysis of impacts of climate change, which are essential in the context of the resilience of coastal communities as well as in assisting countries in identifying major technologies and innovative approaches at various adaptation scales. It is expected that countries will update their climate change adaptation policies to include coastal and marine systems necessary to enhance the resilience of their coastal communities. The two projects respond to Nairobi Convention's Contracting Parties Decision CP.9/1.3 on Work programme for 2018–2022 which requested the Secretariat to develop a regional integrated programme for the full implementation of the strategic action programmes developed under the WIO-LaB project and its extension beyond the lifespan of the Strategic Action Programme.

The WIOSAP and NC-SWIOFC partnership projects are implemented and executed through a "Partnerships Approach" with the Nairobi Convention Secretariat being the Executing Agency. The beneficiary countries are Comoros, Madagascar, Mauritius, Seychelles, Mozambique, Kenya, Tanzania, Somalia and South Africa. The objective of this assignment is to conduct climate change vulnerability assessment on coastal communities that highly depend on coastal and marine resources in Kenya, as part of the regional undertaking.

2.0 Purpose of the consultancy

The purpose of this assignment is to assess the vulnerability of coastal communities to climate change in Kenya, with particular focus on communities that are highly dependent on coastal and marine resources for livelihood and income. The vulnerability assessments are efficient tools for informing climate change adaptation strategies for communities that depend on coastal and marine ecosystems. These assessments will involve describing the intensity of threats and identifying potential impacts, relative to the capacity of the interacting human and ecological systems to cope with such threats. It will also help identify the communities that are most vulnerable to climate change and its impacts and help in developing adaptation plans to help lift those communities that will be severely affected to a state of enhanced resilience. The climate change vulnerability assessments (CCVA) will be undertaken on representative communities that depend on coastal and marine ecosystems in Kenya to complement recent ecological piloting of the regional CCVA Toolkit as part of implementation of the Climate Change Strategy for the Nairobi Convention. A similar CCVA is being undertaken in Tanzania, Mozambique and Madagascar to contribute to the validation of the regional CCVA Toolkit.

2.1 Scope of the Consultancy Assignment

The study will be carried out in compliance with the Terms of Reference (ToR) which includes:

- i) Pilot testing of the CCVA toolkit in Kenya in order to:
 - a) gather and analyze social and economic data relevant to the CCVA of local communities dependent on major coastal ecosystems i.e. mangroves, coral reefs and seagrass beds, and other marine resources, such as artisanal fisheries;
 - b) develop knowledge management products;
 - c) identify specific adaptation technology needs;
 - d) national plans and with a focus on the needs of coastal communities;
 - e) map risks and possible responses to extreme climatic events;
 - f) identify potential networks for the sharing of information on successful adaptation;
 - g) contribute to management and policy option on climate change necessary for decision making.
- ii) Providing for the definition and inclusion of coastal and marine adaptation options in climate change policies at national level and contribute to the enhancement of critical habitats conservation and sustainable marine conservation networks explicitly supporting the social and economic sustainability of coastal communities.
- iii) Quantifying the exposure dimensions at the ecosystem level, and the sensitivity and the adaptive capacity of both the social and ecological systems with focus on:
 - a) the social adaptive capacity and sensitivity dimensions applied to selected local communities in Kenya covering the sites of Gazi, Vanga, Mida and Faza in Lamu;
 - b) defining a mechanism for each community to have access to a diversity of ecosystems, with varying states of ecosystem health, which could provide them with different kinds of opportunities. This study will require participation and inputs from

- local partners and, where possible, representatives in the WIO, which could also inform capacity building of the said participants;
- c) generating critical information on the adaptive capacity of the selected communities, opportunities to enhance their resilience, and key management and policy implications to inform decision making within the context of climate change adaptation;
 - d) providing information necessary to raise and promote awareness around climate change adaptation through networks, partnerships, knowledge products and knowledge sharing events, and platforms in the WIO region; and
 - e) technical support in field designs and eventual data analysis and interpretation will be availed to the Consultant by the Nairobi Convention.
- iv) Prepare and submit a report on the pilot test, including the relative social adaptive capacity and sensitivity scores among communities and detailed recommendations for managers/policy makers for adaptation options and/or mitigation. This will include:
 - a) a detailed description of the relative scores of Social Adaptive Capacity (SAC) and sensitivity indicators;
 - b) the climate adaptation options that can address the identified SAC and sensitivity gaps;and
 - c) Associated data, spreadsheets and summarized information should be in a format that can be integrated with scores from other dimensions to develop an overall integrated CCVA.
 - v) Generate and produce key information awareness products and relevant manuscript targeting peer reviewed journals. The products should be in a format that can be integrated with ecological and climate data to facilitate a more integrated CCVA.
 - vi) Provide for assessments of risks and vulnerabilities (natural and human) and drivers affecting coastal fishery communities using the CCVA toolkit.
 - vii) Review country specific adaptation technology needs, based on existing science and national plans and with a focus on the needs of youth, women, and men within artisanal fishing communities.

2.2 Specific Duties and Responsibilities

The specific duties and responsibilities of the consultant are to:

- a) Review the social aspects of the CCVA toolkit, particularly the sensitivity and adaptive capacity dimensions of vulnerability and the associated socioeconomic survey template and propose revisions to ensure that the tool captures different social and economic contexts in the country.
- b) Develop the sampling design and a generic survey template, including the general operational framework and delivery for the socioeconomic surveys.
- c) Prepare a data template (i.e., in a spreadsheet or any other accessible format) to organize the responses from the socioeconomic surveys.

- d) In consultation with the project manager have a full view of CCVA for the target communities reviewed.
- e) Test the socioeconomic surveys, before revision and application to the target communities.

2.3 Purpose of the inception report

This inception report presents the first deliverable for the consultant in this assignment. It highlights the purpose and scope of the assignment. It outlines the consultant's understanding of what is required and showing how the requirements of the ToR will be addressed by way of: proposed methods and procedures for undertaking the assignment. It includes the proposed work-plan for completing the assignment. It therefore provides the consultant and the client with an opportunity to agree on the approach and methodology being adopted in carrying out the assignment.

3. Methodology

3.1 Study sites

The study will be carried out at eight sites in the coast of Kenya namely Gazi and Vanga in Kwale County, Uyombo, Mida-Majaoni and Dabaso in Kilifi County, and Faza, Matondoni and Ndaui-Kiwayu in Lamu County. The sites were selected based on their proximity and high dependence on mangroves, seagrass beds and coral reefs. Each site has its own unique characteristics. Vanga is a rural fishing village located in a mangrove environment and near the seagrass beds and coral reef in the southern end of the coast of Kenya at the border of Kenya and Tanzania. It has 1190 households with a total population of 5888 people and a population density of 1073 persons per km² (KNBS 2019). It is characterized by increasing fishing effort and transboundary fishing activities that have occasionally resulted in resource use conflicts. Gazi is a rural fishing village located at the mangrove fringed Gazi bay about 60 kilometres south of Mombasa town near the seagrass beds and coral reef. It has 1399 households with a total population of 6733 people and a population density of 115 persons per km² (KNBS 2019). The past 45 years have witnessed the influx of migrant fishermen into this area. The migrant fishermen have introduced new fishing practices that have radically changed the fishery (Ochiewo, 2004).

Uyombo, Mida-Majaoni and Dabaso are located at the mangrove fringed Mida Creek which is a Marine National Reserve in the northern coast of Kenya, where fishing is controlled. It was designated a UNESCO Biosphere Reserve in 1979 (Owuor et al. 2019). The creek is surrounded by seven villages which have been clustered into three main villages in this study namely Uyombo, Mida-Majaoni and Dabaso. Each of these main villages has characteristics which are distinctly different from the other. The three main villages have 6821 households with a total population of 31,782 people (KNBS 2019) broken down as follows:

- Uyombo - 1075 households with a population of 6314 people and population density of 372 persons per km²;

- Mida-Majaoni - 1146 households with a population of 7459 people and population density of 495 persons per km²; and
- Dabaso - 3962 households with a population of 18,009 people and a population density of 735 persons per km².

Besides being located in a mangrove fringed creek, the three main villages are located in close proximity to the seagrass beds and coral reef. Their main economic activities are fishing, crop farming, small-scale business activities and tourism related ventures. Finally the last three sites are Faza, Matondoni and Ndau-Kiwayu villages, which are located in the Lamu Archipelago that has the largest mangrove forest coverage in Kenya. Faza, Matondoni and Kiwayu are typical fishing villages while, Dau is a village that relies solely on mangrove harvesting. The three villages that will be covered in Lamu County have 1467 households with a total population of 6249 people (KNBS 2019) as follows:

- Faza - 650 households with a total population of 2935 people and a population density of 87 persons per km². It has experienced increased fishing pressure which has resulted in significant changes in fishing practices;
- Matondoni - 465 households with a population of 2001 people and a population density of 102 persons per km². It mainly depends on prawn fishery; and
- Ndau-Kiwayu - 352 households with a population of 1313 people and a population density of 61.9 persons per km².

3.2 The research design

A cross sectional survey design will be adopted with questions being asked once in the entire period of study. Cross sectional studies are suitable where the objective is to establish whether significant relationships exist among the study variables at some point in time (Mugenda and Mugenda 2003; 2008). The cross sectional survey will make it possible to collect data in short duration of time. A number of limitations of cross sectional studies have been identified to include cohort differences, potential reporting biases associated with non-response and difficulty in making causal inference. These limitations will however be addressed through an appropriate sampling technique and data collection procedure adopted by this study. Questionnaire survey method will be used in this study because it has been successfully used in similar studies such as Thiault et al. (2021). It is also one of the most important research methods in the social sciences and is used extensively to collect information on numerous subjects of research (Nachmias and Nachmias 2004). In addition, focus group discussions (FGDs) and key informant interviews (KIIs) will be undertaken to validate the information gathered through questionnaire survey. The target population covered in this study includes the communities that are engaged in fishing, gleaning, fish trade, mangrove cutters and dealers at selected sites in Kenya as elaborated in the TORs.

3.3 Sample size and sampling technique

In this study, a sample will be selected from the households that are engaged in fishing, fish trade, gleaning, and mangrove cutting and trade. The sample size is calculated using the following standard formula for infinite population (Naing et al. 2006):

$$n = z^2 p(1-p)/e^2$$

Where n is the sample size, z is the statistical certainty chosen at 95% confidence level ($z = 1.96$) for an error risk of 5%, p is estimated level/coverage to be investigated, chosen at $p = 0.5$, e is precision desired, expressed as a fraction of 1, usually $e = 0.05$ is chosen for the confidence interval. The output is corrected for finite population using the formula (Naing et.al. 2006):

$$n^1 = n/(1+n/N)$$

Where n^1 is the sample size for finite population, N is 10,877 households i.e. the target population of fishing, fish trade, gleaning, and mangrove cutting and trade and n is the calculated sample size from infinite population. A sampling interval (SI) of two is calculated by dividing the total population by the sample size ($n^1 = 371$ households).

Based on the formula for estimation of sample size and considering that the target population consists of 10,877 households; the sum total of the number of households in all selected study sites, it is estimated that the sample size is 371 households.

Table 1: Distribution of the sample sizes by the selected study sites along the coast of Kenya

S. No.	Selected study site	Sample size
1	Faza, Matondoni and Ndau-Kiwayu	112
2	Uyombo, Mida-Majaoni and Dabaso	150
3	Gazi	58
4	Vanga	51
Total		371

The target population will first be divided into strata based on main household occupations that are linked to marine resources namely households that depend on fishing, fish trade, and mangrove wood trade. Systematic random sampling will be used to select the number of households that represent the target population from the identified strata. The respondents will be systematically picked from the sample using the sampling interval to ensure that there are equal chances for each household in the target population to be included in the study (Kothari 2008). This sampling technique will generate a representative sample that allows generalization to a larger population and the usage of inferential statistics. The sampling will be based on the number of households and population density of each site that have been elaborated under the study sites above.

3.4 Data collection

Data will be collected using survey, focus group discussions and direct observation as elaborated by Bunce *et al.* (2000). Survey will be conducted using questionnaires that will be administered to respondents in the four study sites to obtain quantitative data. The questionnaire has been constructed taking into account the objectives of the research (Kothari and Garg 2014), with clear indicators that are both quantitative and qualitative measures as elaborated by Gurney *et al.* (2019). The indicators for sensitivity and social adaptive capacity have been jointly discussed and agreed on during two virtual meetings organized by UNEP Nairobi Convention. The questionnaire (appendix 1) consists of two parts with part 1 having both closed and open ended questions on demographic factors, and part 2 having both Likert scale type of questions and open ended questions on the main variables in the study. Each of the Likert scale questions in part 2 was assessed on a 5-point scale from 1 to 5 (Warmbrod 2014). Vulnerability of coastal communities to climate change will be measured on ordinal scale making use of the Likert scale items in a questionnaire that covers social adaptive capacity and sensitivity dimensions.

Guided questionnaire administration will be adopted in this study in order to capture a representative sample of the target population, avoid potential non-response bias and control for non-verbal behaviour (Nachmias and Nachmias 2004). Questionnaires will be administered in Kiswahili which is the most widely spoken language by trained interviewers. The questionnaire will be administered in the respondent's households or acceptable venues over a period of two months between November and December 2021. The researchers will follow up the target respondents, whose households are pre-selected through the sampling interval and appointments will be booked with them in advance where necessary. To ensure accuracy in reporting and ethical conduct, each respondent will be informed that their personal details would remain anonymous and confidential. Anonymity and confidentiality are fundamental ethical considerations that this study would observe. The overall purpose and objectives of the study will clearly be explained to the respondents and informed consent obtained with a clarification that the questionnaire will be filled on voluntary basis. It is planned that data will be collected for a period of 5 days per site.

Key-informant interview technique expounded by Bunce *et al.* (2000) and De la Torre-Castro *et al.* (2007) will be used to gather information from the opinion leaders. These key-informants are people who hold some respected positions in the society. Some key informant have already been identified namely fisheries officials, forest officials, beach management unit leaders, local administration officials such as chiefs, assistant chiefs and village heads, community development officials, community based organization, Non Governmental Organizations. The snowball method will be used to identify other key informants in the villages. The key

informants will provide insight on many issues that need further clarifications and help in the validation of information collected using the other research methods. Key informant interview guide (appendix 2) will be used to collect information.

The focus group discussions approach proposed by Bunce *et al.* (2000) and de la Torre-Castro *et al.* (2007) will be used in the study. A set of open-ended questions (appendix 3) will be used to prompt participants into free discussions focusing on the issues under the study. The focal groups will consist of 5 to 12 people. Direct observation will be conducted watch and document events as they occur and photography used for documentation. It is expected that each questionnaire will be administered in 30-45 minutes while each focus group discussion will take about 90 minutes to complete.

3.4 Data Processing and Analysis

The collected qualitative and quantitative data will be processed and analyzed. Data processing will include coding and classification of the collected data, cleaning the raw data and organizing data according to emerging themes. Coding will be carried out before data is analyzed. The code will be consistent across cases. Information on what each code means will be listed in a codebook that accompanies the dataset. For the data to make sense, coding rules will be observed by ensuring that numbers assigned make intuitive sense for variables that will be rank ordered. The coding scheme will be exhaustive for every response to fit into a category, and categories will be specific enough to capture differences using the smallest possible number of categories. Data cleaning will be carried out by proofreading the collected data to capture and correct errors and inconsistent codes. Wild codes will be finally checked by generating a frequency distribution which would show the pattern of responses for each variable, and the cleaned data will be organized into emerging themes.

Data analysis will be done with the support of UNEP Nairobi Convention using the Climate Change Vulnerability Assessment (CCVA) toolkit for near-shore marine socio-ecological system in the Western Indian Ocean. The consultant will also conduct exploratory factor analysis on the study variables to identify patterns in data, reduce the data table and number of variables for ease of interpretation according to Cattell (1966), Gorsuch (1983), Nunnally and Bernstein (1994), Pett, Lackey and Sullivan (2003). The necessary tests which involve checking the correlation matrix for evidence of correlation coefficients greater than 0.3, computing Kaiser-Meyer-Olkin Measure of Sampling Adequacy which is required to be above 0.6 (Kaiser 1974), and the Bartlett's Test of Sphericity value required to be significant with $p \leq 0.05$, will be carried out to confirm the suitability of the dataset for factor analysis. After conducting the necessary tests, factor analysis will be performed using principal components as the main factor

extraction technique. The analysis of principal component will involve using the Kaiser's criterion, screeplot and parallel analysis to determine the number of components to retain.

3.5 Reporting

The consultant will report progress during meetings scheduled by the client and will prepare and submit a draft report with recommendations to the client for comments. The client will provide comments on the draft report before a final report is submitted.

4.0 DELIVERABLES

Key deliverables for the assessment of vulnerability of coastal communities to climate change in Kenya include the following:

4.1 Inception Report

Inception report is the first deliverable for the consultancy. It specifies the approach and work plan for undertaking the consultancy.

4.2 Draft Report on the climate change vulnerability assessment

Draft report of the assessment of vulnerability of coastal communities to climate change in Kenya constitutes the second deliverable of the contract and will be due within eleven (11) week of the contract. The client is expected to provide feedback within one week to enable the final report to be delivered in the thirteenth (13th) week. The draft report will be close to the final report in terms of content.

4.3 Final Report on the climate change vulnerability assessment

The final report of the assessment of vulnerability of coastal communities to climate change in Kenya will be prepared based on comments and inputs from the client on the draft report. The final report will provide information on results related to the assessment of vulnerability of coastal communities to climate change in Kenya, and recommendations. It should be ready on the 13th week of the contract.

4.4 Proposed revisions to the social aspects of the CCVA toolkit

Revisions to the social aspects of the CCVA toolkit will be proposed based on the pilot testing and findings of the study.

4.5 A database of existing expertise on climate change and adaptation in Kenya

A database of existing expertise will involve a compilation of existing knowledge and capability in the different institutions and fields that are relevant to climate change and adaptation activities in Kenya.

4.6 Information awareness products on adaptation, mitigation, and technological options

available for the target communities

Information awareness products will be developed based on findings and conclusions of the study.

4.7 Management and policy options for adaptation, mitigation, and technological options available for application

Management and policy options will be developed based on policy response analysis, findings and conclusions of the study.

Table 1: Summary of Deliverables

Deliverable	Time frame
1. Inception report specifying the approach and work plan in undertaking the consultancy	Within one (1) week
2. Draft report on the climate change vulnerability assessment. This report should be close to the final report in terms of content	Eleventh (11 th) week
3. Pilot tested CCVA toolkit with detailed methodology for managers/policy makers	Twelveth (12 th) week
4. Final Report on the climate change vulnerability assessment	Thirteenth (13 th) week
5. Proposed revisions to the social aspects of the CCVA toolkit	Thirteenth (13 th) week
6. A database of existing expertise on climate change and adaptation in Kenya	Thirteenth (13 th) week
7. Other deliverables:- (i) information awareness products on adaptation, mitigation, and technological options available for the target communities (ii) Management and policy options for adaptation, mitigation, and technological options available for application	Fourteenth (14 th) week

5. ACTIVITY WORK PLAN

5.1 Tentative Work plan

This section presents a tentative work plan based on the terms of reference. Based on the Terms of Reference (TORs), the consultancy will take three (3) months to complete from the date of signing the contract. The Final Report on the climate change vulnerability assessment should therefore be in place by the end of 13th week of the contract. Table 2 (Gantt Chart) below presents a summary of the proposed work plan for the assignment.

No.	Deliverables and Related Tasks	Weeks														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	
	of information awareness products on adaptation, mitigation, and technological options available for the target communities															
3.7	Management and policy options for adaptation, mitigation, and technological options available for application															

5.2 Feedback

The client will be expected to provide feedback on the draft report submitted by consultant to enable finalization and timely submission of the final report and the other corresponding deliverables.

References

- Bunce L, Townsley P, Pomeroy R, Pollnac R. (2000). Socioeconomic manual for coral reef management. Australian Institute of Marine Science; p.92-168.
- Cattell, R. B. (1966). The scree test for the number of factors. *Multivariate Behavioral Research*, 1:245-276.
- De la Torre-Castro M, Ochiewo J, Mbaga TK, Pinault M. (2007). A framework for addressing socioeconomic and management aspects of sea cucumber resources in the Western Indian Ocean. *SPC Beche-de-mer Information Bulletin*; 25:22-28.
- Gorsuch, R. L. (1983). *Factor analysis*, Second ed., Lawrence Erlbaum, Hillsdale, NJ.
- Gurney, G.G., Darling, E.S., Jupiterd, S.D., Mangubhai, S., McClanahan, T.R., Lestari, P., Pardede, S., Campbell, S.J., Fox, F., Naisilisili, W., Muthiga, N.A, D'agata, S., Holmes, K.E., Rossi, N.A. (2019). Implementing a social-ecological systems framework for conservation monitoring: lessons from a multi-country coral reef program. *Biological Conservation* 240:108298.
- Kaiser, H. (1974). An index of factorial simplicity. *Psychometrika*, 39: 31-36.
- KNBS (2019). 2019 Kenya population and housing census. Volume II: Distribution of population by administrative units. Kenya National Bureau of Statistics, Nairobi.
- Kothari, C. R. (2008). *Research methodology: Methods and techniques*. New Age International Publishers, New Delhi.
- Kothari, C., Garg, G. (2014). *Research methodology*. New Age International (P) Ltd. Publishers, New Delhi.
- Maina J.M. (2019). Climate Change Vulnerability Assessment (CCVA) toolkit for near-shore marine socio-ecological system in the Western Indian Ocean. Report prepared for UNEP-Nairobi Conventio, 55pp.
- Mugenda, O. M., Mugenda, A. G. (2003). *Research methods – quantitative and qualitative approaches*. African Centre for Technology Studies, Nairobi.
- Mugenda, O., Mugenda, A. (2008). *Social science research: Theory and principles*. Acts Press, Nairobi.
- Nachmias, C. F., Nachmias, D. (2004). *Research methods in the social sciences*. Arnold, London.
- Naing, L., Winn, T., Rusli, B. N. (2006). Practical issues in calculating the sample size for prevalence studies. *Archives of Orofacial Sciences*, 1:9-14.
- Nunnally, J. C., Bernstein, I. H. (1994). *Psychometric theory*, Third ed., McGraw-Hill, New York.
- Owuor M.A., Ulwa R., Otieno, P., Icely J., Newton, A. (2019). Valuing mangrove biodiversity and ecosystem services: A deliberative choice experiment in Mida Creek, Kenya. *Ecosystem Services* 40:101040. <https://doi.org/10.1016/j.ecoser.2019.101040>
- Pett, M. A., Lackey, N. R., Sullivan, J. J. (2003). *Making sense of factor analysis: The use of factor analysis for instrument development in health care research*, Sage, Thousand Oaks.
- Thiault, L., S. D. Jupiter, J. E. Johnson, J. E. Cinner, R. M. Jarvis, S. F. Heron, J. M. Maina, N. A. Marshall, P. A. Marshall, and J. Claudet. 2021. Harnessing the potential of vulnerability assessments for managing social-ecological systems. *Ecology and Society* 26 (2):1. <https://doi.org/10.5751/ES-12167-260201>.
- Warmbrod, J. R. (2014). Reporting and Interpreting Scores Derived from Likert-type Scales. *Journal of Agricultural Education*, 55(5):30-47. <https://doi.org/10.5032/jae.2014.05030>.

APPENDIX 1: CLIMATE CHANGE VULNERABILITY ASSESSMENTS IN SELECTED COASTAL COMMUNITIES IN KENYA

QUESTIONNAIRE

Study site: _____ County/District: _____

Village: _____ Date: _____

Survey no.: _____ Name of interviewer: _____

Latitude/longitude: _____

PART 1: SENSITY DIMENSION

Demographic Characteristics (*Please tick one*)

- 1) Age (in years):
- 2) Sex:
 - [1] Female [2] Male [3] Other
- 3) Formal education:
 - [1] Class 8 or less [2] Secondary school - level certificate [3] A-level certificate
 - [4] Tertiary [5] University and above
- 4) What is your religion?
 - [1] Muslim [2] Christian [3] Hindu
 - [4] Traditional [5] Other (specify)
- 5) Marital status: [1] Single [2] Married [3] Married before [4] Other
- 6) Where are you originally from? (*Tick only one option below*)
 - [1] This village [2] Another village in this county [3] Coastal area other than this location [4] This country (not coastal area) [5] Another country
- 7) How many years have you lived in this village?
- 8) How many people are currently in your household, including yourself? (*Please write down the number of people below each category*)

Adult male	Adult female	Male children	Female children

9) What is your employment status? [1] Unemployed [2] Employed

10) If employed, what form of employment are you engaged in?

11) If unemployed, is anyone from your household engaged in formal employment?

[1] No [2] Yes

12) Please give details of employment for any members of your household who are employed (specify type of occupation) _____

13) If unemployed, how do you earn income or obtain food and other necessities?

14) How much income do you earn per week/month/year? KShs. _____

PART 2: CLIMATE CHANGE

1) In your view, is weather pattern is changing?

[1] No [2] Yes [3] Don't know

2) If yes, why could this be happening? _____

3) Have you heard of climate change?

[1] No [2] Yes [3] Don't know

4) If yes, can you tell me what you know about it? *Please tick all answers given*

- | | |
|--|--|
| <input type="checkbox"/> Drought – inadequate rain | <input type="checkbox"/> More storms & extreme weather |
| <input type="checkbox"/> Floods – too much rain | <input type="checkbox"/> Increased disease |
| <input type="checkbox"/> Sea level rise | <input type="checkbox"/> Impact on fish catch |
| <input type="checkbox"/> Warmer conditions | <input type="checkbox"/> Other |

5) From which source did you get information about climate change?

- [1] Television [2] Radio [3] Newspaper [4] Internet
[5] Government agency [6] Environmental groups [7] Friends/family [8] School/college/university

6) How important is the issue of climate change to you?

- [1] Not important at all [2] Not very important [3] Not sure [4] Quite important [5] Very important

7) If important, why is it important to you? _____

- 8) In your view, what causes climate change? _____
- 9) In your view, what are the impacts of climate change? _____
- 10) Have you experienced any form of flood damage or drought in the past 5 years?
 [1] No [2] Yes [3] Don't know
- 11) Are you worried about the floods, droughts or other extreme events affecting your family?
 [1] Not worried [2] A little worried [3] Not sure [4] Worried [5] Very worried
- 12) What do you think can be done to tackle climate change? _____

- 13) What successful adaptation approaches can you recommend? _____
- 14) What concerns you about these adaptation approaches? _____
- 15) In your view, who should tackle the issue of climate change?
 [1] The National Government [2] The County Government [3] International Organizations [4] Business & Industry [5] Individuals [6] Environmental groups [7] Others (specify) _____
- 16) Have you ever taken any action as an individual to address climate change?
 [1] No [2] Yes [3] Don't know
- 17) How could you be helped to manage the challenges posed by climate change?

In the subsequent sections, please select one response against each of the statements

- 18) The surrounding environment is changing due to increased human activities
 [1] Strongly disagree [2] Disagree [3] Unsure
 [4] Agree [5] Strongly agree
- 19) The climate is changing
 [1] Strongly disagree [2] Disagree [3] Unsure
 [4] Agree [5] Strongly agree
- 20) Temperature is rising

[1] Strongly disagree [2] Disagree [3] Unsure
[4] Agree [5] Strongly agree

21) Rainfall is decreasing every year

[1] Strongly disagree [2] Disagree [3] Unsure
[4] Agree [5] Strongly agree

22) There have been increased incidences of droughts

[1] Strongly disagree [2] Disagree [3] Unsure
[4] Agree [5] Strongly agree

23) Rainfall has increasingly become unreliable

[1] Strongly disagree [2] Disagree [3] Unsure
[4] Agree [5] Strongly agree

24) Rainfall has been increasing

[1] Strongly disagree [2] Disagree [3] Unsure
[4] Agree [5] Strongly agree

25) There has been increased intensity of rainfall but over shorter periods than in the past

[1] Strongly disagree [2] Disagree [3] Unsure
[4] Agree [5] Strongly agree

26) There have been increased incidences of floods during the rainy season

[1] Strongly disagree [2] Disagree [3] Unsure
[4] Agree [5] Strongly agree

27) Climate change has led to frequent crop failure

[1] Strongly disagree [2] Disagree [3] Unsure
[4] Agree [5] Strongly agree

28) The cost of food is increasing due to climate change

[1] Strongly disagree [2] Disagree [3] Unsure
[4] Agree [5] Strongly agree

29) Excessive loss of vegetation occurs due to climate change

[1] Strongly disagree [2] Disagree [3] Unsure
[4] Agree [5] Strongly agree

30) Fuelwood is increasingly becoming scarce

- [1] Strongly disagree [2] Disagree [3] Unsure
[4] Agree [5] Strongly agree

31) Climate change has led to decline of mangrove resources

- [1] Strongly disagree [2] Disagree [3] Unsure
[4] Agree [5] Strongly agree

32) Climate change has led to change of livelihoods

- [1] Strongly disagree [2] Disagree [3] Unsure
[4] Agree [5] Strongly agree

33) There is increased awareness on climate Change among the local communities

- [1] Strongly disagree [2] Disagree [3] Unsure
[4] Agree [5] Strongly agree

34) The incidence of climate change will affect the sustainability of our environment

- [1] Strongly disagree [2] Disagree [3] Unsure
[4] Agree [5] Strongly agree

35) Which of the two groups of people below are most seriously affected by climate change?

- [1] The poor [2] The rich

36) Which of the aspects below are most threatened by climate change?

- [1] Health [2] Food supply [3] Fuelwood availability [4] Businesses
[5] Disaster [6] Biodiversity quality and sustainability

37) What are the perceived hindrances to adaptation of modern techniques of combating climate change?

- [1] Lack of improved seeds [2] Lack of access to water for irrigation
[3] Lack of current knowledge on adaptation methods [4] Lack of information on weather
[5] Poverty [6] There is no hindrance to adaptation

PART 3: SOCIAL ADAPTIVE CAPACITY DIMENSION

FLEXIBILITY

Livelihood multiplicity

38) Traditional uses of marine resources

- i. What goods did you obtain from the marine resources in the past?
- ii. Have these goods changed over time? [1] No [2] Yes
- iii. If yes, how?
- iv. How else did you benefit from the marine resources in the past? _____
- v. Has the benefits changed over time? [1] No [2] Yes
- vi. If yes, how? _____
- vii. How do you use marine resources now? _____
 - i. What goods do you obtain from the marine resources now? _____
 - ii. How else do you benefit from the marine resources now? _____

39) What economic activities do you engage in to obtain food or income to your house?

What do other people in your house do that brings in food or money to your house?

Livelihood activity	Tick the respondent's livelihoods	Number of people in the household involved in the economic activity		Rank the economic activities in order of importance
		Women	Men	
Fishing				
Gleaning				
Medium scale fish trade/fish dealer				
Fish mongers (<i>mama karanga</i>)				
Mangrove cutting or trade				
Agent (middleman)				
Aquaculture/Mariculture				
Hunting				
Farming (cash crops)				
Farming (peasant/subsistence, livestock)				
Salaried employment (e.g. teacher, nurse)				

Tourism and handicrafts				
Small business (not marine related)				
Other:				

40) Is fishing your primary livelihood? [1] No [2] Yes

41) If yes, how much do you agree with this statement? (Please circle **one** option):

“I could easily stop fishing, and make my living on land”

Strongly disagree	Somewhat disagree	Neither	Somewhat agree	Strongly agree

42) Cultural/heritage impacts

a) What areas of the marine environment/resources are of special interest to communities for cultural or religious purposes? _____

b) Has this changed over time? [1] No [2] Yes

c) If yes, how? _____

Fishing and Marine Resources Management/Gear diversity

43) Do you own a boat? (Tick as appropriate)

[1] No boat

[2] Boat without a motor (e.g., canoe)

[3] Boat with a motorized engine (engine has __hp)

[4] Other (specify) __

44) Which fishing gears do your household use? (Tick appropriately)

Gear	Tick gear used	Gear	Tick gear used
Hand line (inshore/reef)		Purse seine net	
Hand line (offshore/blue water)		Hand spear	
Multiple hooks (more than 20)		Spear-gun	
Trolling line		Fish trap	
Mesh gillnet, above 5cm (2 inches)		Explosives/Poison	
Mesh gillnet, below 5cm (2 inches)		Gleaning	
Mosquito nets		Other(specify):	
Small/beach seine net (nets dragged along substrate)		Other(specify):	

45) Which fishing gear is the most important to your household? _____

46) Where is your fishing ground? _____

47) Catch, fishing effort and catch value:

Parameter	Details
Quantity of fish & other seafood landed (Kgs/ Bundles/pieces)	
Number of fishing crew	
Number of hours (fishing and travelling)	
Total value of catch (local currency)	

48) Typically, what percentage of your catch from fishing or gleaning do you sell, retain for own consumption or give away?

Retain for own consumption _____%, sell _____%, give away _____%, don't know _____%

49) If you were to get 50% less catch all year, what would you do? (*Tick multiple boxes*)

Keep fishing at same amount	Fish more often	Change fishing grounds	Change fishing gears	Fish less & switch to other livelihood	Stop fishing entirely
Other(specify):					

50) In general, how often do you and your household eat locally caught fish or other sea food that was caught by you or someone in your community? (*Please circle one*)

More than once per day	Once per day	More than once per week	Once per week	More than once per month

51) Over the past 5 years, has the number of fish caught around your area changed?

[1] No [2] Yes, If yes, how has it changed? (*Tick one option*)

[1] Significant decrease [2] Decrease [3] No change

[4] Increase [5] Significant increase

52) What can be done to increase availability of fish in the sea around here? _____

ORGANIZATION

53) In general, how much do you trust the following people? (Tick **one** option for each group)

	Not at all	Distrust more people than trust	About half-half	Trust more people than distrust	Trust all
People in your village					
Village leaders					
Marine resource management group					
NGOs					
Government					

54) Are there places where people are not supposed to fish, nor use certain gears, etc.?

[1] No

[2] Yes

[3] Don't know

55) If yes, provide details in the matrix below

Rule	Description of rules, e.g. what gears are not used etc.	Who created the rules? (tick <u>multiple</u> boxes if necessary)	Do people still fish there? If so, how many? (tick <u>one</u> box)
Places where people are not supposed to fish		<input type="checkbox"/> Fishers/local users <input type="checkbox"/> NGO <input type="checkbox"/> Government <input type="checkbox"/> Other: _____ <input type="checkbox"/> Don't know	<input type="checkbox"/> No one <input type="checkbox"/> A few <input type="checkbox"/> About half <input type="checkbox"/> Most <input type="checkbox"/> Everyone <input type="checkbox"/> Don't know
Certain fishing gears that people are not supposed to use		<input type="checkbox"/> Fishers/local users <input type="checkbox"/> NGO <input type="checkbox"/> Government <input type="checkbox"/> Other: _____ <input type="checkbox"/> Don't know	<input type="checkbox"/> No one <input type="checkbox"/> A few <input type="checkbox"/> About half <input type="checkbox"/> Most <input type="checkbox"/> Everyone <input type="checkbox"/> Don't know
Certain times that people are not supposed to fish		<input type="checkbox"/> Fishers/local users <input type="checkbox"/> NGO <input type="checkbox"/> Government <input type="checkbox"/> Other: _____ <input type="checkbox"/> Don't know	<input type="checkbox"/> No one <input type="checkbox"/> A few <input type="checkbox"/> About half <input type="checkbox"/> Most <input type="checkbox"/> Everyone <input type="checkbox"/> Don't know

Certain types of fish that people are not supposed to catch		<input type="checkbox"/> Fishers/local users <input type="checkbox"/> NGO <input type="checkbox"/> Government <input type="checkbox"/> Other: _____ <input type="checkbox"/> Don't know	<input type="checkbox"/> No one <input type="checkbox"/> A few <input type="checkbox"/> About half <input type="checkbox"/> Most <input type="checkbox"/> Everyone <input type="checkbox"/> Don't know
Other, please describe:		<input type="checkbox"/> Fishers/local users <input type="checkbox"/> NGO <input type="checkbox"/> Government <input type="checkbox"/> Other: _____ <input type="checkbox"/> Don't know	<input type="checkbox"/> No one <input type="checkbox"/> A few <input type="checkbox"/> About half <input type="checkbox"/> Most <input type="checkbox"/> Everyone <input type="checkbox"/> Don't know

Social Capital

56) Social networks

- a) Are there times when you go to someone else for help? [1] No [2] Yes
- b) If the answer to question a) is yes, who do you run to for help in times of need?

- c) Why do you run to this person(s) and not any other person(s)? _____
- d) Who are the key decision makers in the community? _____
- e) How are decisions made in the community? _____

Learning

57) Local perception of marine resources management and management success

- a. In your opinion, are the marine resources managed well? _____
- b. What aspects of management do you consider successful in your area? _____

- f) Is there effective enforcement of rules and regulations governing marine resources? [1] No [2] Yes
If yes, explain: _____
- c. Are the local communities involved in marine resources management?
[1] No [2] Yes
If yes, how? _____
- d. What is your opinion regarding marine resources conservation? _____

- 58) Level of understanding of human impacts on marine resources
- Are there any activities that damage marine resources in the area? _____
 - Are you concerned about sustainability of the marine resources? _____
- 59) Distance from village to nearest market _____
- 60) How is cultural knowledge passed down by the community from one generation to another? _____
- 61) Is there any cultural memory, traditions, and assets that relate to coastal and marine resources that have been handed over to you? _____

Food Security and Wellbeing

- 62) Were there any moments in the last month when your home did not have enough food to eat? [1] No [2] Yes [3] I don't know
- 63) Was this unusual? [1] No [2] Yes [3] I don't know
- 64) In the past year, have there been times when you feared that your food would not last until you were able to get more?
[1] No [2] Yes [3] I don't know
- 65) In general, how many times do you eat in a day?
[1] Once [2] 2 times [3] 3 times [4] Over 3 times

ASSETS AND ACCESS TO CREDIT

Material Style of Life

- 66) Material style of life and owned assets. *Please tick all the household items or facilities present in the household. Also record the number of each asset owned*

Cooking pots [1] No [2] Yes How many:	Radios/cassette/CD [1] No [2] Yes How many:	DVD/VCD players [1] No [2] Yes How many:
Mattresses [1] No [2] Yes How many:	Mobile phone (not smart phone) [1] No [2] Yes How many:	Smart phone sortables [1] No [2] Yes How many:

Flushing toilet [1] No [2] Yes How many:		Indoor piped water (tap) [1] No [2] Yes How many:	
Washing machine [1] No [2] Yes How many:	Computers [1] No [2] Yes How many:	Electric refrigerators or freezers [1] No [2] Yes How many:	
Cattle/Goats/Pigs /Sheep(livestock) [1] No [2] Yes How many:		Televisions [1] No [2] Yes How many:	Satellite dishes [1] No [2] Yes How many:
Private toilet [1] No [2] Yes How many:	Other1 [1] No [2] Yes How many:	Other2 [1] No [2] Yes How many:	
Roof Material <input type="checkbox"/> Bamboo/Thatch <input type="checkbox"/> Wood <input type="checkbox"/> Metal <input type="checkbox"/> Tile <input type="checkbox"/> Other:_____	Wall Material <input type="checkbox"/> Bamboo/Thatch <input type="checkbox"/> Wood <input type="checkbox"/> Metal <input type="checkbox"/> Cement <input type="checkbox"/> Other:___	Floor Material <input type="checkbox"/> Dirt/Soil <input type="checkbox"/> Wood <input type="checkbox"/> Concrete <input type="checkbox"/> Tile <input type="checkbox"/> Other:_____	Electricity <input type="checkbox"/> Solar <input type="checkbox"/> Generat or <input type="checkbox"/> Grid <input type="checkbox"/> None <input type="checkbox"/> Other:___

67) Community infrastructure

- a) How are the communities governed?
- b) How do the communities relate with higher levels of government?

68) It would be great to know more about how you feel about your life here. All things considered, has your satisfaction with your life as a whole changed over the last three years? [1] No [2] Yes. If so, how has it changed? *(Please tick **one** option)*

Much worse	Worse	No change	Better	Much better

69) *If there was a change, what are the three main causes of this change?*

1. _____
2. _____
3. _____

70) Supposing that for some reason you were moving away from your current village, how would you feel about leaving?

Very sad	Sad	Neither happy nor sad	Happy	Very happy

71) Do you have access to savings to respond to extreme climatic events? [1] No [2] Yes

72) Do you have access to credit facilities? [1] No [2] Yes; Explain _____

73) For people dependent on marine resources, do you have access to markets?

[1] No [2] Yes

74) Do both men and women have equal access to resources? [1] No [2] Yes

75) Are there any barriers restricting access to the coastal and marine resources?

[1] No [2] Yes Explain _____

AGENCY

Recognition of causality

76) Does fisheries and mangrove management affect this community? [1] No [2] Yes

77) Does fisheries and mangrove management affect you? [1] No [2] Yes

78) If yes, what are the positive impacts of fisheries and mangrove management for you?

79) What are the negative impacts of fisheries management on you? _____

80) In general, do you think management has affected fish stocks?

[1] No [2] Yes [3] Don't know

If yes, how has the fish stock been affected? (*Please tick **one** option*)

Much worse	Worse	No change	Better	Much better

81) In general, do you think management has affected the quality (e.g., size) of fish and other sea food landed? (*Please tick **one** option*)

A lot less	Somewhat less	No change	Somewhat more	A lot more

82) In general, do you think management has made it easier or harder to catch fish and other sea food (in terms of time, effort, or travel distance)? (*Please tick **one** option*)

Much harder	Hard	Neither	Easier	Much easier

Level of participation

83) Currently, are you involved in the following aspects of marine resources management?

a) decisions about marine resource use (attending meetings about marine resources)

Not at all	Seldom	Never	Often	Very often

b) management of marine resources

Not involved	Involved a little	Never	Involved	Highly involved (in leadership)

84) In general, do you think the way that decisions are made about marine resource use and management are fair? *(Please circle one option)*

Very unfair	Unfair	Neither	Fair	Very fair	Don't know

Why? _____

85) Is there any conflict over marine resources here? If yes, how often does this conflict occur? *(Please circle one option)*

No conflict	Daily	Weekly	Monthly	More than once per year	Less than once per year	Don't know

SUPPLEMENTARY QUESTIONS - Adaptation to Covid-19

86) How has COVID-19 impacted how you and your family obtain food and income compared to how you normally would at this time of year?

87) Have you and your family made any changes to cope with these impacts?

[1] No [2] Yes

88) If the answer to question 74 is yes, please explain _____

89) Has COVID-19 changed the quantity of fish or other sea food that much you have been catching compared to how you would normally catch at this time of year?

[1] No [2] Yes.

If yes, how?

Much worse	Worse	No change	Better	Much better

90) Has COVID-19 impacted the fish market? [1] No [2] Yes

Please explain _____

91) Are people in the community able to access markets? [1] No [2] Yes

Please explain _____

92) Have you and your family made any changes to cope with these impacts? Please tell me about them _____

93) Has COVID-19 changed the price of fish now compared to this time of year normally?

How? _____

Has COVID-19 affected the types and variety of food you and your family are eating now, compared to normally at this time of year? [1] No [2] Yes

If yes, how? _____

94) Are there foods you normally eat at this time of year that you are not able to eat at the moment? [1] No [2] Yes.

If yes, why?

95) Have you and your family made any changes to cope with these impacts? Please tell me about them.

96) What impacts has COVID-19 had on livelihoods in the community? _____

97) Has the number of people who are engaged in fishing changed? [1] No [2] Yes

If yes, how? _____

98) Has the intensity of fishing changed? [1] No [2] Yes

If yes, how? _____

99) How has the community responded to COVID-19? _____

APPENDIX 2: Checklist for Key Informant Interviews

Targeted Key Informants: Fisheries officials, forest officials, beach management unit leaders, local administration officials such as chiefs, assistant chiefs and village heads, community development officials, community based organization, Non Governmental Organizations

Study site: Date:

Name of the Interviewee:

Occupation:

Name of Ward:

Age:..... Sex:Contact:.....

1. What types of marine ecosystems are present in the sites: Mangroves, Coral reefs, Seagrass beds? If the interviewee has a Land use or seascape map with villages on it, discuss about the locations of the ecosystems. If not, prepare and bring a map and point out the ecosystems locations.

Exposure

2. Have communities in the site experienced changes in climate? And how the current climate is different from that of 20-30 years ago?
3. Explain on how the following parameters affected your livelihood activities; - Precipitation change, sea level change, water temperature change, change in wind, air temperature change, humidity change, ocean acidification, ocean current change, extreme temperature frequency, drought frequency, storm surge and extreme marine heat events
4. What are the main climate parameters that have the most impact on fish communities?

Sensitivity

Livelihood

5. What are the impacts of climate change on coastal and marine resources? How have they been affected?
6. What are the impacts of climate change on the community livelihoods?
7. Where do you or coastal community in your area depend on for survival between land or coastal and marine based livelihood? Why?
8. To what extent do you or coastal community in the site rely on coastal and marine resources for survival?

Cultural

9. Are there any important cultural, traditional or spiritual practices associated with the sea
10. What are the cultural benefits from coastal and marine resources that local communities enjoy? Have these cultural benefits affected by climate change? How?

Health

11. What are the impacts of climate change on local community's health? Food and waterborne Diarrheal Disease, Air Pollution, Food security (Length of the lean season), mental health and stress-related disorders.

`Adaptive capacity

Flexibility

12. Business size /Frequency of fishing in the community (Difference from a reference time) [Livelihood multiplicity]
13. Time spent in the sea (Difference from a reference time) [Spatial mobility]
14. Fishing distance from the shore (Difference from a reference time) [Spatial mobility]
15. Gear diversity
16. What are the main sources of income?(1) Fishing (2) Commerce (3) Agriculture(4)Workers (For another households)(5) Other

Organization

17. Are there migrant fishers in the site? Have they settled permanently or temporarily? What period of the year do they fish and where?
18. How many different ethnic groups are there in the site?
19. Are there conflicts/problems about marine resources here? If conflict happens, (b) who is involved? (c) What is the conflict about? (d) What is the intensity? (e) What is the frequency? (f) How is the conflict resolved? [Community cohesion]

Assets

20. When were there interventions by government, NGOs, projects or individuals from outside the village (e.g. nurseries, environmental awareness, infrastructure, school, running water, hospital)? [Community infrastructures]
21. Do the sites have access to credit? What is the percentage of households that have access to credit? [Access to credits]

Learning

22. How do communities have access to information: Radio, Mobile...[Access to information]
23. Governance (will be added to Organization)
24. How is the site managed? Community based? Government based? NGOs?
25. What types of activities have you [the interviewee] been involved in?
26. What tools have you used? How effective were these tools in reaching and motivating Fishers?
27. Who have your efforts been focused on?
28. Who have you collaborated with?
29. What are the sources of weather and climate information in the site?
30. Do people break rules?
31. Places where people are not supposed to fish
32. Certain fishing gears that people are not supposed to use
33. Certain times that people are not supposed to fish
34. Certain species or types of fish that people are not supposed to catch

APPENDIX 3: Focus Group Discussions

Category	Aspect covered
Participant characteristics	Participant demographic profiles, including age, sex, residence, income, education, years participating in activity
Physical health, individual	Physical health condition of individuals
Demographic characteristics	Demographic statistics for place-based and activity-based communities
Social stratification	Type and degree of social stratification and differences based on site and socioeconomic activities
Power structure	People, public and private organizations and institutions who have influence or authority within the place-based and activity communities.
Occupational structure	Occupational structure based on place and activities of communities