International Journal of Bio-resource and Stress Management https://ojs.pphouse.org/index.php/IJBSM

Crossref

IJBSM June 2025, 16(6): 01-07 **Article** AR6161

Research Article *Social Science*

DOI: HTTPS://DOI.ORG/10.23910/1.2025.6161

Adaptive Behavior of Farmers in Cyclone Vulnerable State of India: Global Priorities Weightage Analysis

Biswajit Mallick[1], Sudhanand Prasad Lal[2] and Bijaylaxmi Behera[3]

[1]Dept. of Extension Education, College of Agriculture, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha (751 003), India

[2]Dept. of Agricultural Extension Education, Post Graduate College of Agriculture, Dr. Rajendra Prasad Central Agricultural University Pusa, Samastipur, Bihar (848 125), India

[3]Dept. of Extension Education and Communication Management, Dr. Rajendra Prasad Central Agricultural University Pusa, Samastipur, Bihar (848 125), India

Open Access

Corresponding sudhanand.lal@rpcau.ac.in

0000-0002-6288-5276

ABSTRACT

The ex-post facto study was conducted during (May-July, 2022) at two districts Odisha. Through an ex-post facto study, the study offered actionable insight through the Farmers' Cyclone Adaptive Capacity Index (FCACI) in Odisha, focusing on 160 respondents across eight villages using the Analytic Hierarchy Process (AHP). Globally, Climate change emerged as a serious issue for human civilizations. It was undoubtedly an unprecedented phenomenon. Variations in weather patterns endanger food production, while the rise of sea levels enhanced the risk of catastrophic events like flooding, cyclones, and storm surges that exacerbate extreme poverty, inequality, and famine in the world. Cyclone was one of the disastrous climatic events in eastern India. Farmers suffered every year due to cyclones and floods in terms of production, and storage of the produce which retard their economic and social growth. Though it costs the life and property of the coastal communities, it was not easy to shift with their land and man so they become adaptable to such vagaries. The concept of adaptive capacity was crucial and needed a careful investigation at micro level. Broad factors such as human-social, economic, environment, and physical responsible for the adaptive capacity of farmers were calculated by using the Analytic Hierarchy Process (AHP), a psycho-mathematical tool for analyzing complex decisions. It was found that 'Physical' factor (0.37) was more responsible for adaptive capacity followed by Human-social (0.28), Economic (0.21), and 'Environment' factor (0.14) in cyclone affected areas. Community participation and institutional setup like cyclone shelters were crucial for enhancing resilience.

KEYWORDS: Adaptive capacity, analytic hierarchy process, community participation, cyclone

***Citation* (VANCOUVER):** Mallick et al., Adaptive Behavior of Farmers in Cyclone Vulnerable State of India: Global Priorities Weightage Analysis. *International Journal of Bio-resource and Stress Management,* 2025; 16(6), 01-07. HTTPS://DOI.ORG/10.23910/1.2025.6161.

Data Availability Statement: Legal restrictions are imposed on the public sharing of raw data. However, authors have full right to transfer or share the data in raw form upon request subject to either meeting the conditions of the original consents and the original research study. Further, access of data needs to meet whether the user complies with the ethical and legal obligations as data controllers to allow for secondary use of the data outside of the original study.

Conflict of interests: The authors have declared that no conflict of interest exists.

RECEIVED on 19th February 2025 RECEIVED in revised form on 05th June 2025 ACCEPTED in final form on 17th June 2025 PUBLISHED on 25th June 2025

1. INTRODUCTION

Even though climate change is a natural process, the gradual increase in anthropogenic activities manifold the process in past few years. Climate variability such as change in temperature and precipitation are increasing the probability of catastrophic events over the globe. Among the catastrophic events, tropical cyclones (TCs) are known to have significant global impacts as it set back a country's development by affecting economic, ecosystem, human health, and livelihoods for several decades (Hsiang and Jina, 2014). Along with, the only food producing sector i.e. agriculture and allied sector is highly vulnerable due to dependent on climate. The number sharply increasing since 2002 and by reaching 2019, globally 800 million people were affected by the tropical cyclones with an average 560 million people are exposed every year (Jing et al., 2024). India, in south Asia is one of the disaster prone country due to its distinct geophysical position, varied climate, and environmental factors (Mallick et al., 2023a). The environmental factors also have detrimental effect on human healthcare facilities in hospitals (Upadhyay, et al., 2024), milk production among livestock (Dogra et al., 2024). India has a coastline of about 5,400 km which affected by cyclones with varying frequency and intensity in every year (Mandal and Mohapatra, 2005). Wagner (2023) found that, in India 14% people residing near to Bay of Bengal (BoB) are frequently exposed to the cyclonic events. The country has experienced and badly affected by 27 tropical cyclones in past five years (Barua, 2024). According to Anonymous (2013), 5–6 TCs formed year-1 over the North Indian Ocean (the BoB and the Arabian Sea) accounts for only 7% of the global tropical cyclones, but the cyclones were destructive while crossing over the mainland. More or less, 61% TCs over BoB strike different parts Indian coast, while only 23% affect Bangladesh and Myanmar coast and the rest 16% dissipate over the Sea (Anonymous, 2021). A total of 13 coastal states and Union Territories (UTs) in the country are vulnerable to cyclones, out of which 4 coastal states (Andhra Pradesh, Odisha, Tamil Nadu, and West Bengal) and one UT (Puducherry) on the east coast as well as (Gujarat) on the west coast are more susceptible to cyclonic events (Mohapatra et al., 2012). During October-November, over 58% of the tropical cyclones (TCs) formed and cross over the BoB struck the Odisha-West Bengal coast (Anonymous, 2019; Anonymous, 2021). Odisha is one of the cyclone prone state as 480 km of the coastal plain of the state has faltered and is exposed to Bay of Bengal (Anonymous, 2021). The state's economy is significantly reliant on weather patterns, both directly through agriculture (Patel et al., 2019) and fisheries (Mishra and Malakar, 2020) and indirectly through non-farm wage labor and dairy farming. These sectors are jeopardized by the increasing frequency of extreme weather events. Farmers suffer every year due to cyclones and floods in terms of production, and storage of the produce which retard their economic and social growth. Though it costs the life and property of the coastal communities, it is not easy to shift with their land and man so they become adaptable to such vagaries (Mallick et al., 2023b). In simplified meaning, the adaptive capacity is "the potential or capability of a system to adapt to climatic stimuli or their effects or impacts" (Smit and Pilifosova, 2001). However, there are very limited studies available which evidence the effective adaptation practice, describe the situation, impacts and resilience of extreme weather events in the context of livelihood in the state. As, the concept of adaptive capacity was crucial and it was investigated carefully in the study.

2. MATERIALS AND METHODS

2.1. Selection of the study area

The study was conducted during (May-July, 2022) at two districts Odisha as the highest number of cyclones landfall in last two decades (Anonymous, 2018). According to the report of Anonymous (2021), while the cyclones crossing over the coastal Odisha the impact was more or less intense to the Ganjam district and Puri district. So, both the districts were selected purposively. Afterwards, two blocks from each district and two villages from each block were selected randomly to conduct the study at microlevel. 20 respondents from each village who were involved in a variety of occupations like crop farming, fishing, livestock rearing, and labourer were selected randomly to make the sample of 160 respondents for primary data collection. Statements to determine components and sub-components of adaptive capacity were carefully investigated and selected through

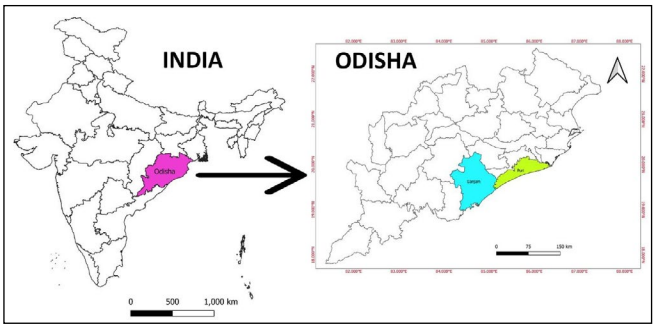

Figure 1: visualization of maps consisting study locale

various secondary sources like review of literatures.

2.2. Comparison among various components responsible for adaptive capacity

The components and sub-components of adaptive capacity were compared among themselves to determine which

component and/or sub-component was more responsible for the adaptive capacity of the respondents in the study area. Analysis of adaptive capacity was done by the Analytic Hierarchy Process (AHP) (Saaty, 1980).

Thomas L. Satty developed the Analytic Hierarchy Process in the 1970s. It was a psycho-mathematical tool for analyzing complex decisions. Calculation in AHP was based on principles of the "Paired comparison technique" and Thurstone's "Law of comparative judgment." A pairwise comparison method was used in AHP to identify the overall priority of each factor considered by the respondents, which, in turn, determined the adaptive capacity to any catastrophic situation. Various components like "human-social," "environment," "economic," and "physical" categories were compared pair-wise on a 9-point scale. In AHP, two questions were answered: 1. which factors had more relative importance, and 2. How much importance does one factor have as compared to the other within a particular category? Then "Eigen-value Technique" was used to find out relative local priorities. Lastly, global priorities were determined by multiplying local priorities with the scaling factor. AHP calculated the quantitative importance of each component related to adaptive capacity.

2.3. Procedure for analytic hierarchy process (AHP)

Before any decision-making in AHP, the first requirement was the disintegrating decision problem into decision elements in a hierarchical structure. The analytic Hierarchy Process was a psychological measurement. Through a pair-wise comparison, a hierarchic formulation of multi-criteria was associated with it. The convenience included in AHP was the ability to make both qualitative and quantitative decision attributed commensurable, and its flexibility regarding the objectives (Kangas, 1992). It had the advantage of providing "objective decisions" based on the subjective and personal preferences of a respondent or a group of respondents.

2.4. Step-wise description of the application

2.4.1. Step I: problem modeling

Identification of decision problems was important. The objective should be defined clearly at the outset. These were the essential features of "problem modeling" in AHP. Under each of the factors, then derive the component. Under each component/criterion, there should be multiple sub-components. The problem structure should include less number of components and sub-components yet cover a vast aspect. Figure 2 describes the problem modeling of different subcomponents to each component.

2.4.2. Step II: pair-wise comparison

In the next step, different sub-components were compared pair-wise; in the next level, components were also compared pair-wise among themselves. Thus, based on comparison, in each case (both sub-components and components) alternative values were defined and the "comparison matrix" can be formed.

$$M=(a_{ij})=\begin{array}{c} \\ D_1 \\ D_2 \\ \vdots \\ D_n \end{array}\begin{array}{c} \begin{array}{cccc} D_1 & D_2 & \dots & D_n \end{array} \\ \begin{bmatrix} 1 & a_{12} & \dots & a_{1n} \\ 1/a_{12} & 1 & \dots & a_{2n} \\ .. & .. & .. & .. \\ 1/a_{1n} & 1/a_{2n} & \dots & 1 \end{bmatrix} \end{array}$$

2.4.3. Step III: Judgmental scale

AHP can evaluate quantitative and qualitative components as well as sub-components on the equal preference scale. A nine-point scale proposed by Saaty (2008) was used for value judgment. Verbal statements were turned into integers from one to nine based on the degree of importance of one over another. Where, 1 represented equal importance to 9 represented extreme importance.

2.4.4. Step IV: aggregation of judgment

Respondents' opinions were aggregated through various processes. These processes were termed as "Aggregation of Individual Judgments" (AIJ) and the "Aggregation of Individual Priorities" (AIP). Here, the AIP method was used by taking the geometric mean while calculating the priorities of adaptive capacity, and the arithmetic mean was calculated to aggregate the priorities among the components. According to the derived value from the AIP method, a comparison matrix was developed for the group of individuals.

2.4.5. Step V: Determination of consistency ratio

Saaty (1977) developed a consistency index (CI) based on the eigen value method. The "Eigen value" (λ_{max}) can be obtained by summing of products of each element of "Eigen vector" multiplied by the total of columns of the reciprocal matrix. He also proved that the biggest "Eigen value" equals the number of comparisons (λ_{max}=n). "Consistency Index" can be calculated by the following formula.

$$CI=\frac{(\lambda_{max}-n)}{(n-1)}$$

Where,

N=matrix dimension

λ_{max}=Maximum eigen value

Calculation of Consistency ratio

The ratio can be determined as: CR=CI/RI,

Where CI-Consistency Index

RI-Random Index

The value of Random Index is predefined up to 10 number of statements

N	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.49

2.4.6. Step VI: calculation of priorities

Calculation of the scaling factor was of most important part in AHP. The scaling factor or priority would show the degree of importance of a particular factor in terms of the overall objective. Various components would have local priority (scaling factor within a particular sub-component) and global or overall priority (scaling factor in relation to overall objective). Thus, the cardinal importance of each component or sub-component in the overall scale was determined. For Priority or local weights divide each element of the row by the sum of each column in the "comparison matrix". After normalizing the "Eigen vectors" average the value of the components/sub-components across the new rows to identify scaling factors or priority vectors. Likewise, the priority of adaptive capacity to the overall goal and the local priority of components were calculated. For the global priority of the components towards the overall objective, the priority vector had to be multiplied by the local priorities of respective components within that same group.

3. RESULTS AND DISCUSSION

3.1. Priority weights of the various components through the analytical hierarchy process

The quantitative importance of each component of the adaptive capacity was calculated. Results portrayed in Table 1 explained that the Physical component had the highest scaling factor (0.37), followed by Human-social (0.28), Economic (0.21), and Environment (0.14), respectively. The consistency ratio (0.025) was less than 0.1 indicated consistencies of the data.

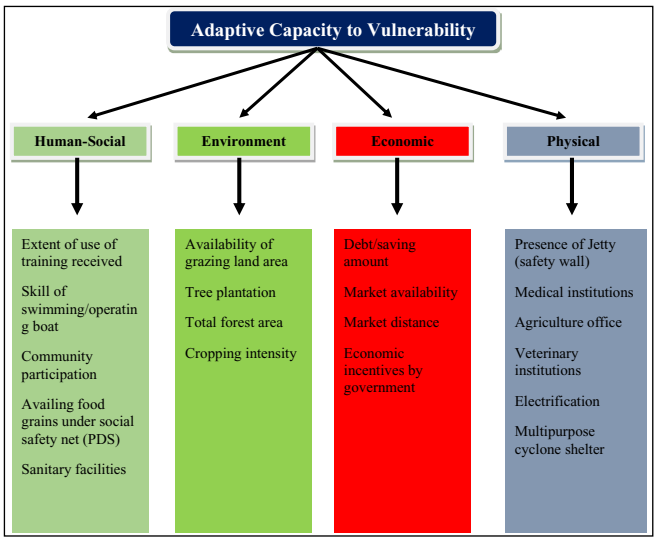

Figure 2: Conceptual framework of components and sub-components of adaptive capacity

3.2. Various sub-components responsible for adaptive capacity

Different sub-components were identified under each component, i.e., Human-social, Environment, Economic, and Physical. Then the quantitative analysis of each sub-component was done to determine the local priority. The priority weights/scaling factor value of each component was multiplied by the local priority value of the respective sub-component to determine the overall or global priority and the sub-components were ranked. The importance of each sub-component to component as well as the importance to adaptive capacity was evaluated and summarized below.

It is apparent from Table 2 that, various sub-components had their respective global priority value which indicated the importance of each factor to the overall adaptive capacity in the study locale. In Human-Social component,

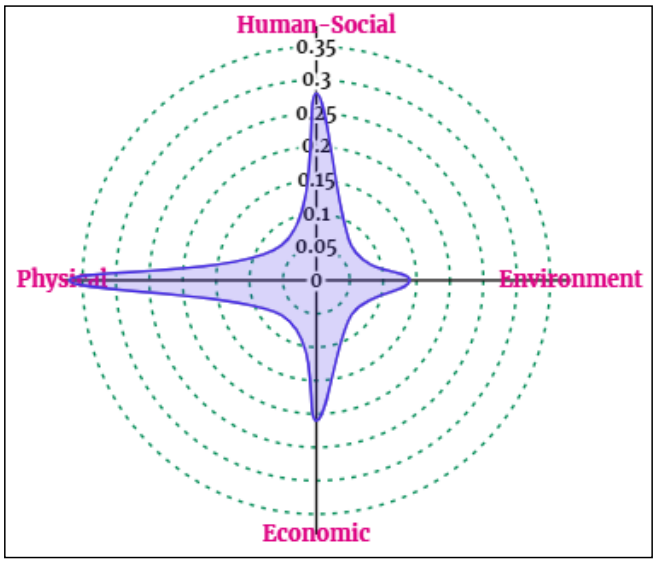

Figure 3: Priority weights/scaling factor value of components

'Community participation' had global priority (GP-0.10), 'Availing food grains under social safety net (PDS)' (GP-0.08), 'Skill of swimming or operating boat' (GP-0.04), 'Extent of use of Training received' (GP-0.03), and 'Sanitary facilities'(GP-0.03). In the environment component, 'Total forest area' (GP-0.05), 'Tree plantation' (GP-0.04), 'Cropping intensity' (GP-0.03), and 'Availability

Table 1: Distribution of components priority weights of adaptive capacity

Scaling factor value of components				λ_{max}	Consistency index	Consistency ratio
Human-Social	Environment	Economic	Physical			
0.28	0.14	0.21	0.37	4.069	0.023	0.025

Table 2: Prioritization of components and sub components responsible for adaptive capacity in cyclone prone areas of Odisha

Components	λ_{max}	Sub-components	Consistency index	Consistency ratio (<0.1)	Local priority	Global priority	Overall rank
Human-Social (0.28)	5.139	Community participation	0.034	0.031	0.36	0.10	I
		Availing food grains under social safety net (PDS)			0.29	0.08	II
		Skill of swimming or operating boat			0.16	0.04	III
		Extent of use of Training received			0.10	0.03	IV
		Sanitary facilities			0.09	0.03	IV
Environment (0.14)	4.036	Total forest area	0.011	0.013	0.37	0.05	I
		Tree plantation			0.29	0.04	II
		Cropping intensity			0.18	0.03	III
		Availability of grazing land area			0.15	0.02	IV
Economic (0.21)	4.145	Debt/Saving amount	0.048	0.053	0.36	0.08	I
		Market availability			0.30	0.06	II
		Economic incentives by govt.			0.19	0.04	III
		Market distance			0.15	0.03	IV
Physical (0.37)	6.183	Multipurpose cyclone Shelter	0.036	0.029	0.29	0.11	I
		Medical institutions			0.20	0.07	II
		Presence of jetty			0.16	0.06	III
		Electrification			0.13	0.05	IV
		Agriculture office			0.12	0.04	V
		Veterinary institutions			0.10	0.04	V

of grazing land area' (GP-0.02). In the economic component, 'Debt/Saving amount'(GP-0.08), 'Market availability'(GP-0.06), 'Economic incentives by govt.' (GP-0.04), 'Market distance'(GP-0.03). In the physical component, 'Multipurpose cyclone Shelter' (GP-0.11), 'Medical institutions'(GP-0.07), 'Presence of jetty' (GP-0.06), 'Electrification' (GP-0.05), 'Agriculture office' (GP-0.04), 'Veterinary institutions' (GP-0.04).

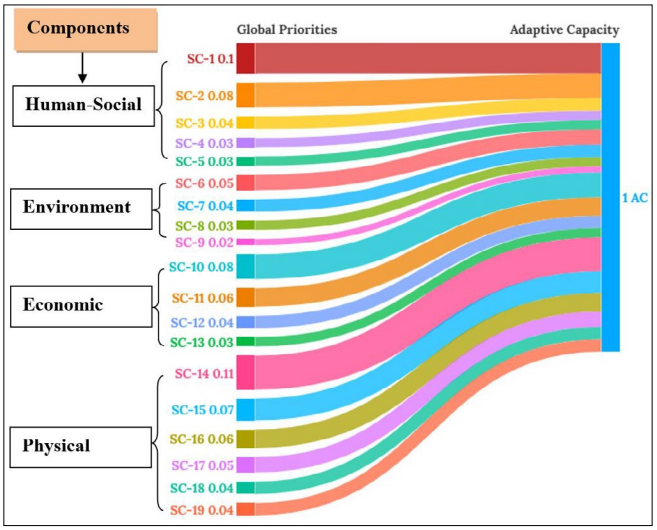

Figure 4: Global priorities of each sub-components towards adaptive capacity

From the above result it was evident that Overall, "Multipurpose Cyclone Shelter" sub-component with global priority (GP-0.11) was most responsible for adaptive capacity. The result was in line with (Dash and Walia, 2020) who found that a few people in Ganjam district were used multipurpose cyclone shelter during the cyclone 'Phailin' in 2013 but approximately 2585 people were shifted during the cyclone 'Fani' in Puri district. Availability of grazing land area (GP-0.02) was least responsible for adaptive capacity because more than 60% of the respondents had low livestock holding. In Human-Social component, Community participation (GP-0.10) was most responsible for adaptive capacity. Anonymous (2022) report 'WASH DIARIES' cited similar findings that the Gaon Kalyan Samity spread levels of awareness within communities (including village youth and adolescents) on the importance of safe water, sanitation and hygiene behaviour (covering water pots, cleaning buckets, cleaning latrines, hand washing with soap etc.) during 'Fani' in Puri district. But the result contradicted as respondents cited as both sanitary facilities and the extent of use of training received (GP-0.03) were least responsible for adaptive capacity respectively. In the

environment component, total forest area (GP-0.05) was most responsible as mangrove forests during cyclones as it acted as a natural barrier and significantly reducing the impact of high winds and storm surged thereby protecting coastal communities from severe damage and loss of life (Das, 2022). Availability of grazing land area (GP-0.02) was least responsible for adaptive capacity. Debt saving-1 amount (GP-0.08) under economic component was most responsible because saving money was a liquid asset and can easily be convertible to cash during emergencies. This could help to fulfil daily requirements even after a great loss. Market distance (GP-0.03) having lowest importance as villages were well connected with local and regional markets. Multipurpose Cyclone Shelter with global priority (GP-0.11) under physical component was found to be the most important sub-component and agriculture office and veterinary institutions (GP-0.04) least responsible for adaptive capacity of the respondents.

4. CONCLUSION

The key factors influencing adaptive capacity, included Human-social, Economic, Environmental, and Physical factors. Physical factors emerged as the most influential, followed by Human-social, Economic, and Environmental factors. The study emphasized that individual adaptive capacity depended on resource availability, while societal adaptation relied on collective action. Community participation (GP=0.10) was found equally important as institutional setups, like multipurpose cyclone shelters (GP=0.11). The study could be further analyzed in extensive version.

5. REFERENCES

Anonymous, 2013. IMD 2013. Cyclone Warning in India: Standard Operation Procedure, India Meteorological Department. Ministry of Earth Sciences. Government of India. Available from: https://rsmcnewdelhi.imd.gov.in/images/pdf/sop.pdf. Accessed on December 16, 2024.

Anonymous, 2018. SRC 2018. Final Memorandum on Very Severe Cyclonic Storm 'Titli' and Subsequent Floods. Revenue and Disaster Management Department, Government of Odisha. Available from: https://srcodisha.nic.in/calamity/Final%20Memorandum%20-%20TITLI.pdf. Accessed on December 18, 2024.

Anonymous, 2019. Government of India 2019. Cyclones and their Impact in India. Available from: https://ncrmp.gov.in/cyclones-their-impact-in-india/. Accessed on December 14, 2024.

Anonymous, 2021. IMD 2021. Cyclone Warning in India Standard Operation Procedure. India Meteorological Department. Ministry of Earth Sciences. Government of India. Available from: https://mausam.imd.gov.in/imd_latest/contents/cyclone.php. Accessed on January 04, 2025.

Anonymous, 2021. OSDMA 2021. State Profile. Odisha State Disaster Management Authority. Available from: https://www.osdma.org/state-profile/#gsc.tab=0. Accessed on January 02, 2025.

Anonymous, 2021a. SRC 2021. Annual reports. Special Relief Commissioner. Government of Odisha. Available from: https://srcodisha.nic.in/annual_report.php. Accessed on January 02, 2025.

Anonymous, 2022b. UNICEF 2022. Badabenakudi Village Spurs Community Participation in Response to the Cyclone Fani Emergency in Odisha, India. WASH DIARIES. Document No: WASH/D/02/2022. Accessed on January 02, 2025.

Barua, K., 2024. List of cyclones that hit India from 2019 to 2024. Published in Jagran Josh. Available from: https://www.jagranjosh.com/general-knowledge/list-of-cyclones-in-india-1591178815-1. Accessed on January 02, 2025.

Das, S., 2022. Valuing the role of mangroves in storm damage reduction in coastal areas of Odisha. In: Haque, A.K.E., Mukhopadhyay, P., Nepal, M., Shammin, M.R. (Eds.), Climate change and community resilience. Springer, Singapore. https://doi.org/10.1007/978-981-16-0680-9_17.

Dash, B., Walia, A., 2020. Role of multi-purpose cyclone shelters in India: last mile or neighbourhood evacuation. Tropical Cyclone Research and Review 9(4), 206–217. https://doi.org/10.1016/j.tcrr.2020.11.002.

Dogra, K., Baweja, P.K., Thakur, K., Bhanwala, V., Tomar, S., 2024. Analysis of environmental footprints of health centers in Kangra District, Himachal Pradesh, India. International Journal of Bio-resource and Stress Management 15(10), 01–09. HTTPS://DOI.ORG/10.23910/1.2024.5623.

Hsiang, S.M., Jina, A.S., 2014. The causal effect of environmental catastrophe on long-run economic growth: evidence from 6700 cyclones. National Bureau of Economic Research, USA. Available from: https://www.nber.org/papers/w20352. Accessed on January 02, 2025.

Jing, R., Heft-Neal, S., Chavas, D.R., 2024. Global population profile of tropical cyclone exposure from 2002 to 2019. Nature 626, 549–554. https://doi.org/10.1038/s41586-023-06963-z.

Kangas, J., 1992. Multiple-use planning of forest resources by using the analytic hierarchy process. Scandinavian Journal of Forest Research 7, 259–268. doi: https://doi.org/10.1080/02827589209382718.

Mallick, B., Lal, S.P., Basumatary, A., 2023a. Impediments and plausible suggestions to farmers in cyclone affected region of Odisha: Kendall's Coefficient of Concordance Approach. Current World Environment 18(1), 235–244. http://dx.doi.org/10.12944/CWE.18.1.20.

Mallick, B., Lal, S.P., Gaur, R.S., 2023b. Utilization pattern of diverse ICT tools by coastal farmers during the warning stages of cyclones. Gujarat Journal of Extension Education 36(1), 90–96. https://doi.org/10.56572/gjoee.2023.36.1.0017.

Mandal, G.S., Mohapatra, M., 2005. Cyclone hazard prone districts of India: A report. National Disaster Management Authority, Government of India, New Delhi.

Mishra, T., Malakar, K., 2020. Loss and damages from cyclone: a case study from Odisha, a coastal state. Development in coastal zones and disaster management, 281–291. https://doi.org/10.1007/978-981-15-4294-7_19.

Mohapatra, M., Mandal, G.S., Bandyopadhyay, B.K., Tyagi, A., Mohanty, U.C., 2012. Classification of cyclone hazard prone districts of India. Natural Hazards 63, 1601–1620. doi: https://doi.org/10.1007/s11069-011-9891-8.

Patel, S. K., Mathew, B., Nanda, A., Pati, S., Nayal, H., 2019. A review on extreme weather events and livelihood in Odisha, India. MAUSAM 70(3), 551–560.

Saaty, T.L., 1977. A scaling method for priorities in hierarchical structures. Journal of mathematical psychology 15(3), 234–281. doi: https://doi.org/10.1016/0022-2496(77)90033-5.

Saaty, T. L., 1980. The analytic hierarchy process. Mcgraw Hill, New York. Agricultural Economics Review 70.

Saaty, T. L., 2008. Decision making with the analytic hierarchy process. International Journal of Services Sciences 1(1), 83–98. doi: 10.1504/IJSSCI.2008.017590.

Smit, B., Pilifosova, O., 2001. Adaptation to climate change in the context of sustainable development and equity. In: IPCC 2001, impacts, adaptation, and vulnerability; The Contribution of Working Group II to the Third Scientific Assessment of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge.

Upadhyay, A., Chakravarty, A.K., Dash, S., Shivahre, P.R., Gonge, D.S., 2024. Effect of environmental factors on milk production traits and energy-corrected milk yield in karan fries cattle. International Journal of Bio-Resource and Stress Management 15(11), 01–08. HTTPS://DOI.ORG/10.23910/1.2024.5675.

Wagner, Z., 2023. Number of people affected by tropical cyclones has increased sharply since 2002. RAND Corporation. Available from: https://www.preventionweb.net/news/number-people-affected-tropical-cyclones-has-increased-sharply-2002#:~:text=Number%20of%20people%20affected%20by%20tropical%20cyclones%20has%20increased%20sharply%20since%202002&text=The%20number%20of%20people%20affected,according%20to%20a%20new%20study.