



Exploring Knowledge Gaps And Research Potentials In Rethinking Traditional Sea Salt Manufacturing: A Literature-Based Study Of The Mandarmani Coastal Stretch, West Bengal

Rabin Das

Assistant Professor, UG & PG Department of Geography

Bajkul Milani Mahavidyalaya, Kismat Bajkul, Purba Medinipur, West Bengal, India-721655

Abstract:

Traditional sea salt manufacturing, once a vital livelihood and cultural practice in coastal West Bengal, is witnessing a rapid decline under the historical policy change, pressure of tourism-led development, land-use change, and socio-economic transformations. This paper investigates the existing body of literature to identify thematic patterns, conceptual gaps, and potential directions for future research in the context of traditional sea salt production along the **Mandarmani coastal stretch** under the Midnapore coast. By employing a systematic literature review approach, this study analyzes national and regional publications, grey literature, and institutional reports spanning environmental, socio-economic, and policy dimensions. The findings reveal significant underrepresentation of traditional salt-making in academic discourse, particularly regarding its socio-ecological significance, historical continuity, gendered labor roles, environmental impacts, and its potential integration into sustainable coastal economies. Moreover, critical issues such as land tenure insecurity, loss of indigenous knowledge, and the absence of supportive policy frameworks remain poorly addressed. This paper also proposes a multi-disciplinary research agenda that integrates environmental history, community-based resource governance, and **coastal livelihood resilience**. The study underscores the urgency of rethinking traditional salt manufacturing not only as an economic practice but also as a repository of cultural heritage and ecological knowledge. By refining the scope for future research, the paper aims to contribute to sustainable development discourse in coastal India and promote the visibility of marginalized artisanal communities in academic and policy frameworks.

Keywords: Traditional sea salt manufacturing, Mandarmani coastal stretch, coastal livelihoods, Literature review, knowledge gaps and research potentials

1. Introduction:

Traditional sea salt manufacturing has long played a crucial role in the socio-economic and cultural fabric of India's coastal regions. Salt production has been a historically embedded livelihood in Bengal, especially within the coastal zones of Purba Medinipur. Once thriving under decentralized indigenous systems, traditional salt manufacturing has steadily eroded due to colonial monopolization (Chatterjee, 2021; Jana, 2024), post-independence industrial transitions, and recent environmental and socio-economic pressures. The Mandarmani-Tajpur belt, a historic nucleus of salt production, now faces livelihood crisis, ecological vulnerability, and cultural disintegration—calling for a region-specific and interdisciplinary

investigation. Along the Mandarmani coastal stretch in the East Midnapore district, artisanal salt production once thrived as a community-driven livelihood deeply embedded in the rhythms of the sea and seasonal labor cycles. However, over the past few decades, this practice has witnessed a stark decline. Factors such as the rapid expansion of coastal tourism, land-use conversions, saline intrusion, market volatility, and weakening policy support have marginalized salt-making communities and undermined their knowledge systems.

Despite its economic, ecological, and heritage value, traditional sea salt manufacturing remains severely underrepresented in mainstream academic and policy discourses. This is particularly evident in the Mandarmani region, where the influx of tourism infrastructure has displaced salt pans and altered coastal land-use dynamics. The cultural memory, environmental knowledge, and gendered labor roles embedded in salt-making practices are being eroded, leaving behind a silent yet profound socio-ecological transformation.

The present study seeks to explore and synthesize existing literature to trace the historical development, contemporary challenges, and possible research directions related to traditional sea salt production in Mandarmani. Employing a systematic literature review approach, this study interrogates thematic blind spots, regional data gaps, and the lack of integrated interdisciplinary perspectives.

In rethinking traditional salt-making, the study situates it as a nexus of livelihood sustainability, cultural resilience, and ecological knowledge in coastal landscapes. By uncovering these gaps, the paper aims to stimulate further empirical and policy-oriented research and enhance the visibility of artisanal salt producers within the broader blue economy and sustainable development frameworks.

2. Statement of the Problem:

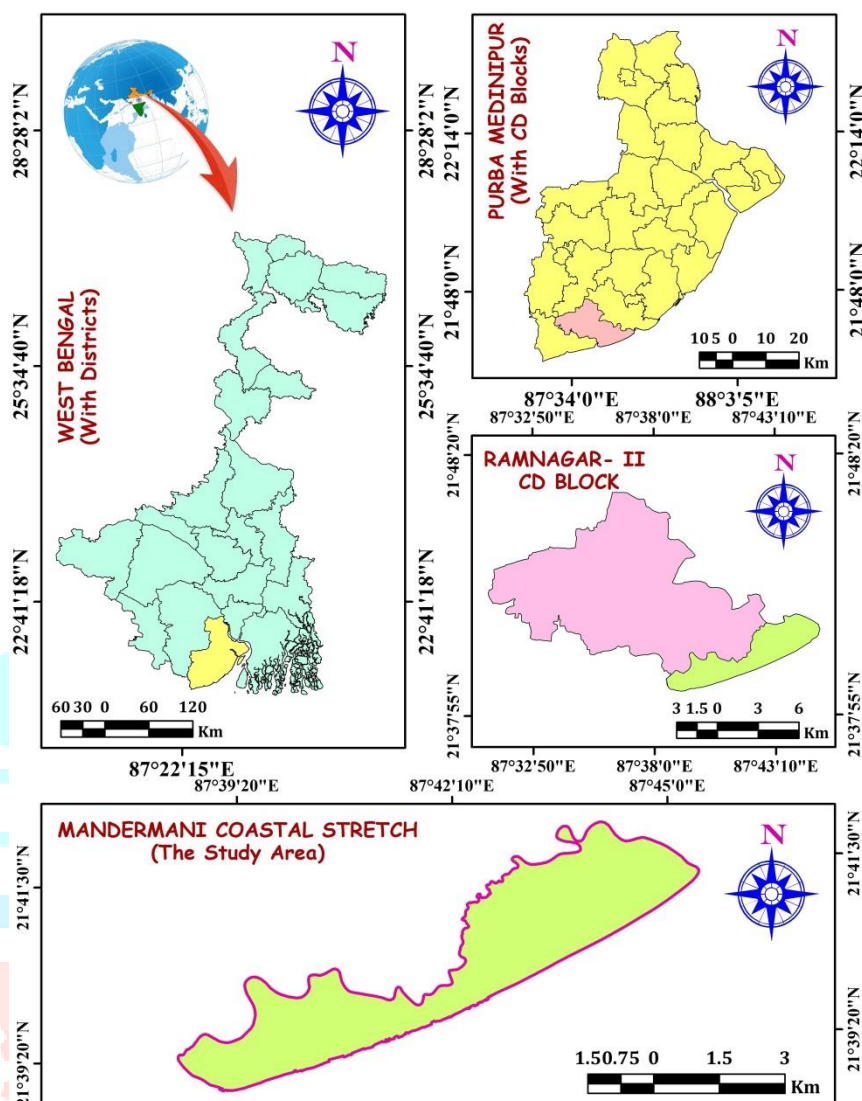
The traditional practice of sea salt manufacturing along the Mandarmani coastal stretch has faced a dramatic decline, exacerbated by tourism-led land transformations, environmental degradation, and systemic neglect in development planning. Once a cornerstone of local livelihood and indigenous knowledge, this practice is now on the verge of extinction, with little formal documentation, academic attention, or policy support. The displacement of salt workers, deterioration of salt pans, and loss of intergenerational knowledge have not only impacted economic viability but also threatened cultural identity and environmental stewardship in the region.

Despite its historical presence and socio-environmental significance, sea salt manufacturing has received scant attention in regional research and planning frameworks. Existing studies are fragmented, often limited to economic assessments, with insufficient exploration of ecological impacts, community adaptation, or cultural transitions. There is also a lack of gender-sensitive, landscape-based, and historically grounded inquiry into this fading coastal tradition.

This research identifies the urgent need to synthesize available knowledge and highlight research gaps to lay the foundation for interdisciplinary studies that reconnect salt-making with broader concerns of coastal resilience, heritage preservation, and sustainable livelihoods. Addressing this neglected area of study is vital for informed policymaking and inclusive coastal development strategies in West Bengal and beyond.

3. The Study Area:

LOCATION MAP OF THE STUDY AREA



Source: ISGPP, IGISMAP, Thy Maps Guide & Google Earth Imagery, 2024

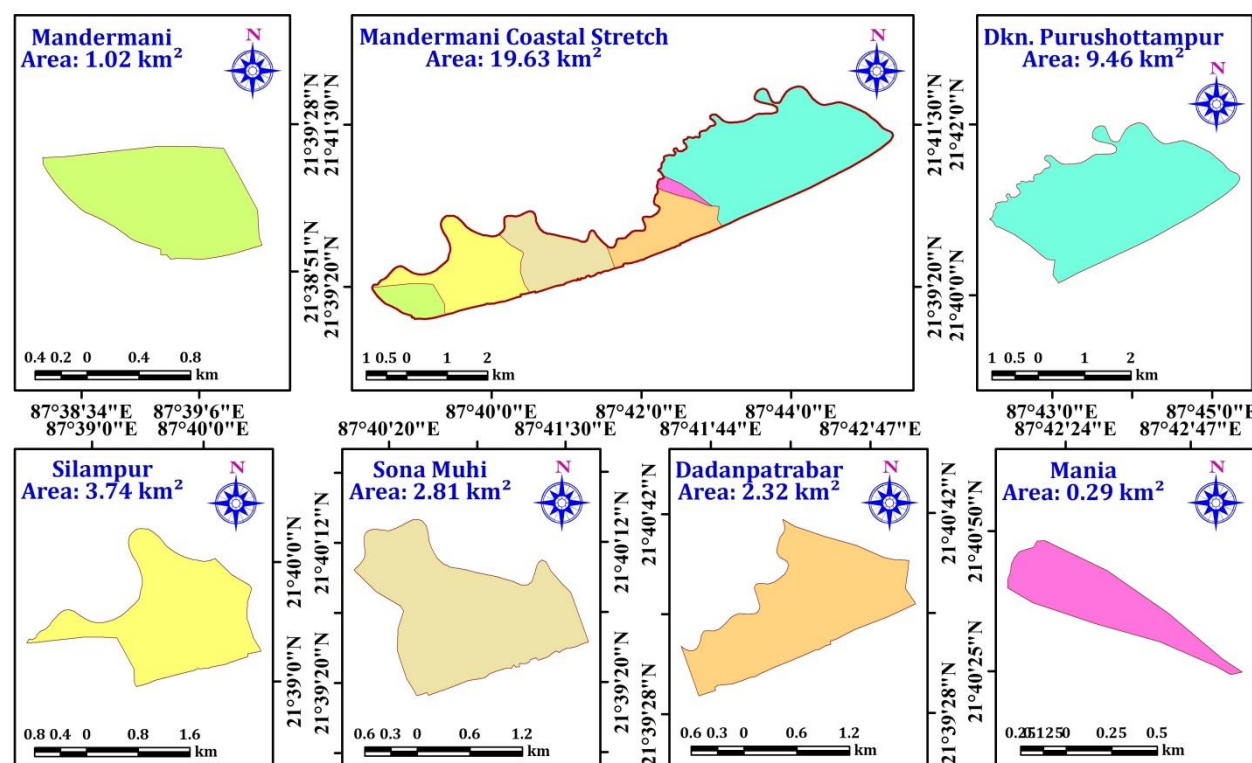
Figure 1: The Study Area

The location of a study area encompasses not only its geographical coordinates but also its broader geo-environmental characteristics, which directly or indirectly influence its landscape and ecological dynamics. The Mandermani coastal stretch, a significant segment of coastal Bengal, stands out due to its pristine natural beauty, dynamic coastal processes, and growing anthropogenic influences.

- **Geographical Coordinates:** The study area is situated between $21^{\circ}38'47''\text{N}$ – $21^{\circ}42'25''\text{N}$ latitude and $87^{\circ}38'23''\text{E}$ – $87^{\circ}45'57''\text{E}$ longitude, making it a crucial coastal section along the Bay of Bengal.
- **Geomorphology & Geology:** Mandermani lies within the **Pichhaboni River sub-basin** of the **South Bengal Basin**, characterized by a **fluvio-coastal landscape** shaped by riverine and marine interactions. Bounded by the **left arm (eastern side) of the Pichhaboni River** and the **right arm of Jaldha Khal**, this region forms part of the **recent fluvio-coastal sedimentary and alluvial sub-formation of the Quaternary-Holocene sequence** of the Bengal Coastal Formation, dating back approximately **6,000–8,000 years BP (Before Present)**.
- **Environmental & Ecological Features:** The Mandermani coastal belt, part of the **Medinipur coastal region**, is flanked by **Soula (coastal Kanthi) to the east** and **Tajpur to the west**. It showcases a distinctive coastal environment, featuring an exceptional interplay of **sea, sand, and sun**, with a landscape enriched by coastal vegetation, including Casuarina trees, dune grass, and mangroves. This stretch is ecologically sensitive, with a delicate balance between natural coastal processes and increasing tourism-related interventions.

- **Administrative Boundaries:** Administratively, the study area consists of **six villages** and forms a rural coastal stretch under the **Kalandi Gram Panchayat of Ramnagar-II CD Block** within the **Contai Sub-Division of Purba Medinipur District, West Bengal**. The growing tourism industry and developmental activities in this region have brought both economic opportunities and environmental challenges, making it a critical area for coastal management and conservation efforts.

VILLAGE LAYOUT UNDER MANDERMANI COASTAL STRETCH



Source: ISGPP- II, IGISMAP and Google Earth (Pro) Imagery-2024

Figure 2: Layout of the Villages under Mandarmani Coastal Stretch

4. Major Research Questions:

- Q1.What are the major thematic and conceptual trends in the existing literature on traditional sea salt manufacturing in coastal India, particularly in West Bengal?
- Q2.What specific knowledge and data gaps exist regarding traditional salt production along the Mandarmani coastal stretch?
- Q3.How have land-use changes, tourism expansion, and environmental pressures contributed to the decline of traditional salt-making practices?
- Q4.What are the socio-cultural and ecological implications of the declining salt economy on local communities?
- Q5.How can future research frameworks be structured to integrate traditional salt production into sustainable coastal development agendas?

5. Specific Objectives:

- O1.To systematically review and analyze existing literature on traditional sea salt manufacturing in the Mandarmani region and broader coastal India.
- O2.To identify knowledge gaps, under-researched themes, and conceptual blind spots related to salt-making practices.
- O3.To explore the socio-environmental transformations influencing the decline of traditional salt production in the Mandarmani coastal stretch.
- O4.To propose a future research agenda that supports interdisciplinary, inclusive, and policy-relevant studies on traditional salt livelihoods in coastal West Bengal.

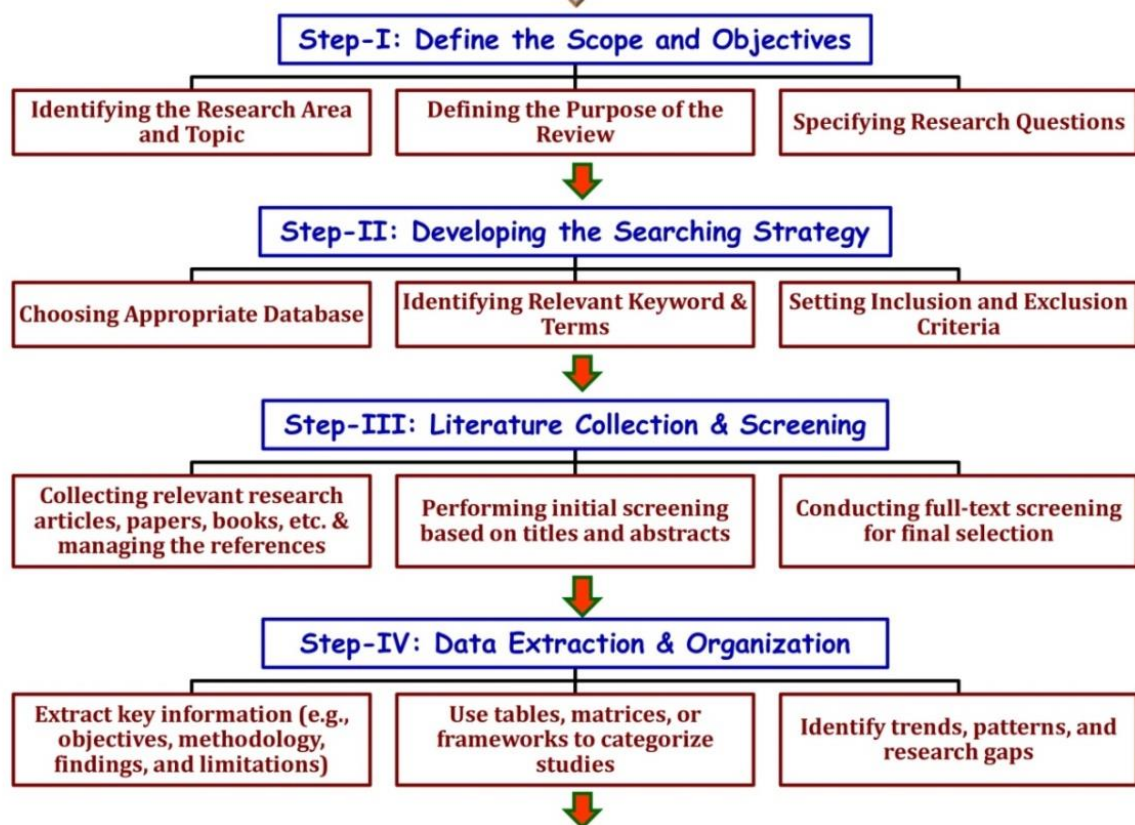
6. Materials, Methods and Methodology:

Stage	Description
Review Approach	Qualitative Systematic Literature Review (SLR) guided by PRISMA protocol to identify, evaluate, and synthesize existing knowledge and research gaps.
Review Period	Literature published between 1980 and 2024
Databases Searched	Google Scholar, Scopus, JSTOR, ScienceDirect, ResearchGate, Shodhganga, Institutional Repositories (e.g., UNDP, Planning Commission), West Bengal State Archives
Search Terms Used	“Traditional sea salt manufacturing,” “artisanal salt production,” “coastal livelihoods,” “Mandarmani coast,” “decline of salt industries in India”
Boolean Operators	AND, OR, NOT (e.g., 'sea salt manufacturing' AND 'West Bengal'; 'artisanal' OR 'traditional'; NOT 'industrial production')
Screening Criteria	Initial screening based on title and abstract relevance; duplicates removed; thematic relevance prioritized
Inclusion Criteria	Peer-reviewed articles, theses, government reports, and grey literature related to traditional sea salt, coastal livelihoods, land-use changes
Exclusion Criteria	Studies focused solely on industrial salt production, non-English sources, unverifiable blogs or opinion pieces
Data Extraction Tool	Literature Review Matrix (with categories: Author, Year, Title, Study Area, Methodology, Key Findings, Themes, Gaps)
Thematic Coding	Manual coding and qualitative clustering into categories such as socio-economic aspects, ecological transformation, policy neglect, and knowledge erosion
Gap Analysis	Identification of under-researched areas across spatial, thematic, and policy dimensions relevant to traditional salt practices
Output of Review	Mapping of research gaps; Identification of key themes and missing linkages; Proposed research framework for future investigation

Phase	Dimension / Aspect	Objectives	Methods & Tools	Data Type
I. Exploratory & Contextual	1. History of Origin and Development	Trace historical evolution	Archival study, literature review, KIIs with elders	Secondary + Qualitative
	2. Environmental Background	Analyze environmental suitability	Topo maps, satellite imagery, IMD data, soil & water tests	Secondary + Lab data
II. Mapping & Temporal Analysis	3. Nature and Trend of the Journey	Study trends over time	Chronological analysis, historical GIS mapping	Secondary + GIS
	4. Recent Spatial Distribution	Identify current salt-producing areas	Field GPS mapping, participatory maps, GIS	Primary + Spatial
	5. Spatio-temporal Change	Detect changes in saltpan land use	LULC classification, change detection (RS)	Remote Sensing + GIS
III. Ground Realities / Field Study	6. Working Scenario	Examine labor, work process, time cycle	Worker interviews, FGDs, field observation	Primary + Qualitative
	7. Traditional Methodology	Document sea salt production process	Process documentation, interviews, flowcharts	Primary + Visual
	8. Functioning Dimension	Understand the economic/marketing chain	Value chain analysis, market actor interviews	Primary

IV. Assessment & Analysis	9. Status of Salt Units	Assess unit performance	Field checklists, operational indicators	Primary
	10. Quantity & Quality	Evaluate output & purity	Lab analysis of salt samples, production records	Primary + Lab
	11. Socio-economic Status	Understand worker livelihoods	Household surveys, LVI formulation	Primary + Quantitative
V. Institutional & Issues Analysis	12. Problems & Prospects	Identify crisis factors & opportunities	FGDs, problem tree, participatory discussion	Qualitative
	13. SWOT Analysis	Evaluate internal & external dynamics	SWOT matrix via stakeholder workshops	Primary
	14. Institutional Roles	Analyze policy support and gaps	Policy review, stakeholder interviews (Govt, NGOs)	Secondary + Interview
VI. Perception & Planning	15. Perception Analysis	Capture local views on decline & potential	Structured perception survey (Likert scale)	Primary
	16. Plan & Model Building	Propose revival strategy	DPSIR, participatory planning, scenario modeling	Analytical + Planning

Methodology of Review Work & Preparation of Review Report



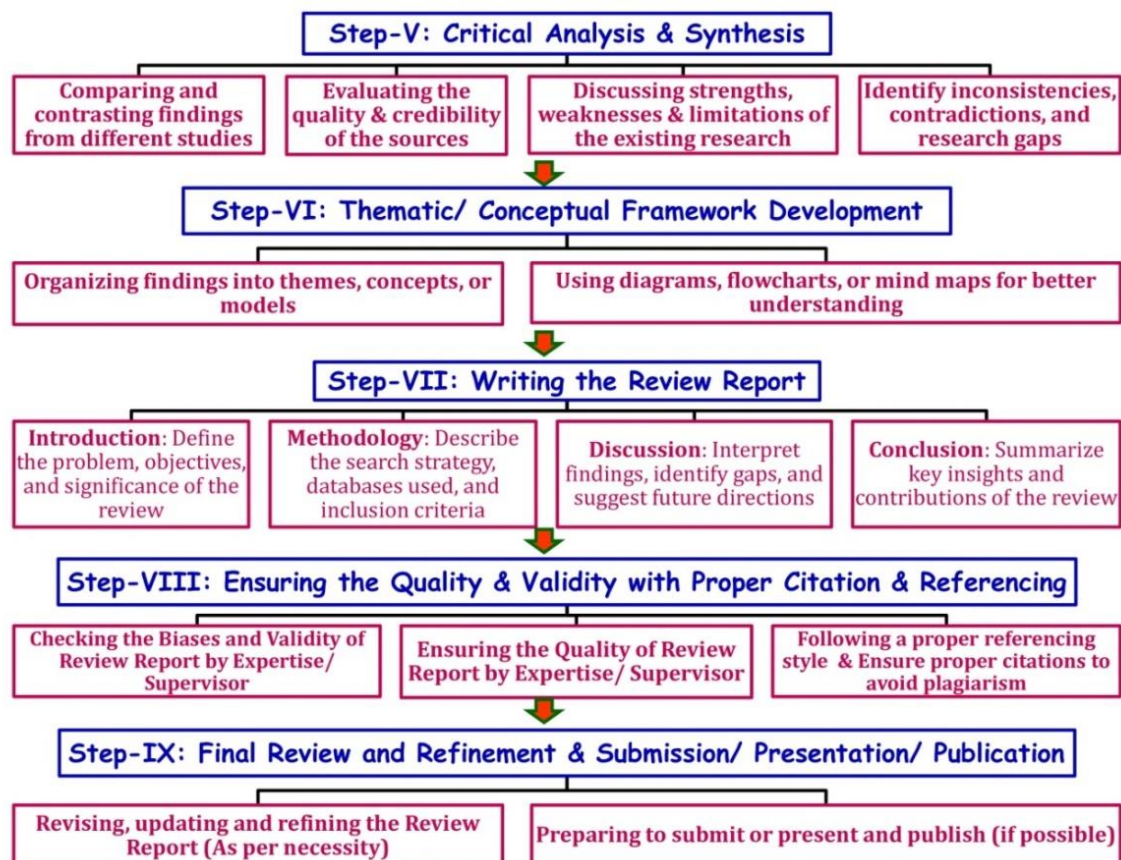


Figure 3: Flowchart of the Methodology for the Review Work

7. Historical Context of Salt Manufacturing and Its Decline in Midnapore including Study Area:

MAPPING OF THE HISTORICAL SEA SALT MANUFACTURING IN THE STUDY AREA

(With respect to Other Dominated Blue Economy in the Recent Time)

[Mandermani Coastal Stretch, Purba Medinipur District, West Bengal (W.B.), India]

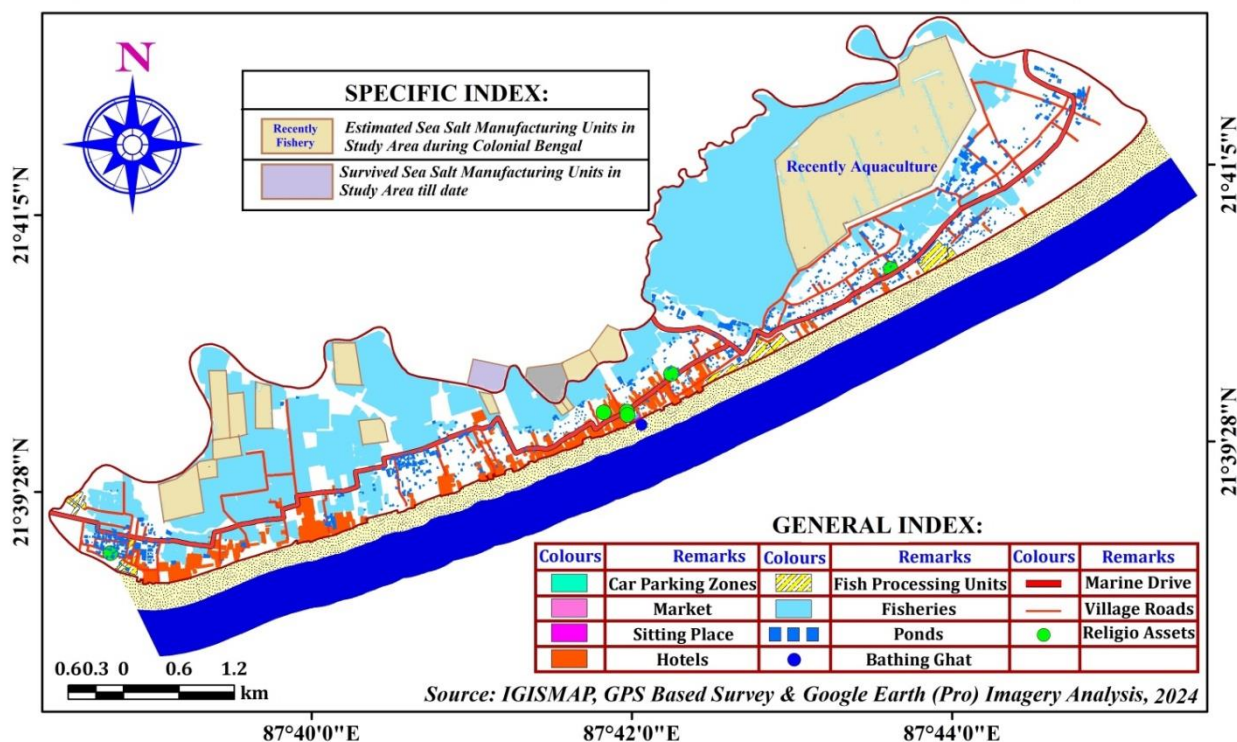


Figure 4: Historical Sea Salt Manufacturing Units in the Study Area

The Midnapore coastline, primarily covering the districts of Purba Medinipur and Paschim Medinipur, was once a significant hub for salt production. The coastal saline wetlands provided an ideal environment for traditional salt pans. According to Ray (2010), salt production in this region dates back to the colonial period when British authorities regulated and taxed salt, affecting its indigenous production.

However, despite state control, local production persisted until the mid-20th century when industrial and policy changes began to impact its sustainability.

☛ Factors Contributing to the Decline:

❖ Economic and Policy Constraints:

The liberalization policies of the 1990s and the increased import of industrially refined salt led to a significant decline in traditional salt-making activities. As per Banerjee & Chakraborty (2015), local salt producers struggled to compete with large-scale industrial production, which benefited from better infrastructure, technology, and government incentives.

❖ Environmental and Climatic Challenges:

Coastal erosion, changing monsoon patterns, and rising sea levels have also contributed to the diminishing status of salt pans in Midnapore (Das, 2018). Erratic weather conditions have disrupted salt production cycles, reducing yields and increasing costs for small-scale producers.

❖ Technological Disparities:

Lack of technological advancement has also been a crucial factor. Traditional salt production methods involve solar evaporation techniques that are labor-intensive and time-consuming. Sinha et al. (2020) argue that without mechanization and modern processing techniques, small producers find it difficult to remain viable in a competitive market.

❖ Socio-Economic Impact on Local Communities:

The decline of salt manufacturing has directly impacted the livelihoods of thousands of workers in Midnapore. Several studies (Choudhury & Ghosh, 2021) suggest that unemployment and forced migration have risen as traditional salt-making families shift to other occupations, such as fishing and small-scale trade. The lack of alternative employment opportunities has exacerbated economic distress in these coastal regions.

8. Broad Literature Review:

Table 1: Review-1showing summary, literature gaps and research potentials regarding salt manufacturing	
Category	Details
Paper	"The Saga of India’s Salt Workers"
Author (s)	Dr. Anis A. B. Choudhery & Miss Simeen Rumani
Publisher/ Journal	BOBP-IGO commissioned by the Salt Commissioner’s Office, Government of India (2004–2005), Bay of Bengal News - March 2006, pp 37-40
Publishing Year	2006
Review Summary	- Provides a comprehensive socio-economic overview of salt workers across seven Indian states. - Highlights poor working conditions, low wages, and lack of basic amenities (water, schools, healthcare) in salt pans, particularly in Gujarat, Tamil Nadu, and Rajasthan. - Describes labour practices, including manual salt extraction methods and the prevalence of contractual, seasonal work. - Uses structured surveys and PRA techniques to document issues like health problems (TB, blindness, skin lesions), child labour, lack of education, and unsafe environments. - Emphasizes the invisible contribution of salt workers to India’s economy and the need for urgent welfare interventions.
Research Gaps	- Lacks quantitative analysis of wages, employment duration, and health morbidity across regions. - Does not assess gender-specific vulnerabilities or differences in access to welfare among men and women. - Minimal ecological or environmental analysis of salt production’s impact on local landscapes. - No policy implementation evaluation of schemes like NMAY or planned reverse osmosis plants. - Limited exploration of migrant dynamics, caste stratification, or long-term livelihood

	diversification. Absence of comparative analysis with similar labor-intensive industries in India or abroad.
Research Potentials	Longitudinal and comparative studies across states on wages, health, and education outcomes of salt worker families. - Gender-sensitive research focusing on women workers' health, social status, and work-life conditions. - Impact assessment of reverse osmosis pilot plants, NMAI housing, and other welfare schemes. - Feasibility studies for technological interventions and safety equipment adoption in traditional salt pans. - Investigation of climate impacts (e.g., rising temperature, water scarcity) on salt production sustainability. - Development of policy models for inclusive modernization and worker cooperatives in the salt industry.
Source: Author's Own Composition based on Literature [9]	

Table 2: Review-2showing summary, literature gaps and research potentials regarding salt manufacturing

Category	Details
Paper	"Socio-Economic Status of Workers in the Salt Industry in India"
Author (s)	Yugraj Singh Yadava, Rajdeep Mukherjee & Ram Mundhe
Publisher/ Journal	Bay of Bengal Programme Inter-Governmental Organisation Chennai - 600 018, India (Prepared for the Salt Commissioner's Organisation Ministry of Commerce and Industry (Department of Industrial Policy and Promotion) Government of India), pp 1-183
Publishing Year	2006
Review Summary	- A pioneering national-level empirical study covering 7 major salt-producing states (Gujarat, Tamil Nadu, Rajasthan, Andhra Pradesh, Maharashtra, Orissa, West Bengal). - Assesses the socio-economic status of over 1,000 salt workers, their livelihood vulnerabilities, and linkages with the salt industry. - Offers a comprehensive livelihood framework—analyzing human, physical, financial, social, and natural capital of workers. - Evaluates government welfare schemes like NMAI and CRS and their implementation gaps. - Provides state-specific comparisons on income, education, migration, health, employment, gender, and caste. - Suggests policy reforms and industrial restructuring for sustainable worker welfare and industry modernization.
Research Gaps	- Lack of longitudinal data on salt worker livelihoods, employment cycles, and migration over decades. - Limited attention to climate change effects on salt production areas and health/environmental hazards. Underrepresentation of gender-specific challenges, particularly in terms of unpaid labor, wage disparity, and access to health care. - No deep exploration of children's education, dropout reasons, and intergenerational poverty traps. - Insufficient analysis of worker unionization efforts, resistance movements, or political mobilization history. - Absence of a comparative policy framework against global models of labor welfare in unorganized sectors.
Research Potentials	- Scope for spatial-temporal analysis (e.g., using GIS) of salt pan distribution, migration, and land-use change. - In-depth gender-focused studies to assess women's role, vulnerabilities, and empowerment strategies in salt labor.

	• Opportunity for ethnographic studies or oral histories of salt worker communities across states. • Research on climate resilience and environmental adaptation for sustainable salt production and health impact mitigation. • Exploration of cooperative and worker-owned salt production models for inclusive growth. • Policy research to evaluate effectiveness of welfare schemes and suggest scalable models for informal sector labor protections.
Source: Author's Own Composition based on Literature [34]	

Table 3: Review-3 showing summary, literature gaps and research potentials regarding salt manufacturing

Category	Details
Paper	"Environmental Balance of Salt Production Speaks in Favour of Solar Saltworks"
Author (s)	V.M. Sedivy
Publisher/Journal	Global NEST Journal, Vol 11, No 1, pp 41-48
Publishing Year	2009
Review Summary	• Focus: Comparative assessment of solar salt production vs. industrial methods (vacuum crystallization, mechanical vapor recompression), highlighting the efficiency, purity, and environmental performance of solar saltworks. • Key Insights: ▪ Solar salt production converts solar energy with 45% efficiency, exceeding many industrial energy systems. ▪ Advanced solar saltworks can yield salt of up to 99.94% purity, comparable to vacuum salt. ▪ Impurity management is critical—biological and chemical controls enhance crystal quality. ▪ Hydrosol process significantly improves salt purity and reduces energy/water usage. ▪ The chemical industry benefits from high-quality solar salt due to fewer impurities (e.g., Ca, Mg, SO₄) that damage membranes and increase operational costs. ▪ Solar saltworks support ecological services (e.g., bird habitats) while remaining low-emission and resource-efficient.
Research Gaps	• Socio-economic impact: No analysis of labor dynamics, community roles, or livelihoods in solar salt production areas. • Gender and labor: Absence of discussion on gender roles or socio-cultural dimensions in salt production. • Policy frameworks: No mention of regulatory, institutional, or governance mechanisms influencing salt industry transitions. • Regional comparisons: Limited insight into variations across countries or regions in solar salt practices and technological adoption. • Health and safety: Does not address worker health conditions, PPE use, or occupational hazards. • Long-term environmental impact: While efficiency is discussed, long-term ecological changes (e.g., soil salinity, biodiversity) are not quantified.
Research Potentials	• Socio-ecological systems: Examine how solar saltworks intersect with local communities, ecosystems, and traditional knowledge systems. • Gender-inclusive analysis: Study gendered participation, access to technology, and labor burdens in solar vs. industrial salt sectors. • Policy integration studies: Evaluate how climate policy, energy subsidies, and labor

	laws can support solar salt industry scaling. • Comparative techno-economic studies: Model and compare cost-efficiency and output of solar vs. mechanical/thermal salt processes globally. • Ecological impact assessments: Quantify effects of solar saltwork expansion on wetland ecology, salinity levels, and avian biodiversity. • Climate adaptation potential: Investigate how solar saltworks can be positioned as climate-resilient livelihoods in saline coastal zones.
Source: Author's Own Composition based on Literature [30]	

Table 4: Review-4 showing summary, literature gaps and research potentials regarding salt manufacturing

Category	Details
Paper	"A Study on Salt Manufacturing Environment and Importance of Salt Pans toward Economic Growth of the Coastal Areas of Purba Medinipur"
Author (s)	Abhay Sankar Sahu
Publisher/ Journal	Artha Bekshan (Journal of Bangiya Artaniti Parishad, Bengal Economic Association), pp 118-130
Publishing Year	2012
Review Summary	• The article addresses the labour rights violations, social insecurity, and exploitation faced by salt workers across India. • Focuses on economic marginalization, lack of collective bargaining power, and absence of structured employment in both organized and unorganized salt sectors. • Draws attention to widespread non-compliance with labor laws (Minimum Wages Act, Equal Remuneration Act, ESI, EPF, Bonded Labour Act). • Highlights the seasonal nature of work, rampant child labor, and vulnerability of women workers to exploitation and harassment. • Stresses the need for a national-level strategy and strong unionization to ensure sustainable livelihood and security for salt workers.
Research Gaps	• Lacks region-wise disaggregated data to analyze localized variations in violations and vulnerabilities. • Absence of empirical case studies or quantitative analysis to substantiate observations. • No structured evaluation of welfare scheme coverage, benefit delivery, or effectiveness (e.g., NMA, health insurance). • Limited documentation of gender-based disparities in wages, workload, and access to legal recourse. • Underexplored environmental challenges (e.g., climate change, land degradation) affecting salt pans and worker health. • Does not provide a framework for monitoring and accountability mechanisms for labor rights enforcement.
Research Potentials	• Opportunity for comparative policy studies on implementation of labor rights across different states and salt-producing regions. • Field-based participatory research with salt worker communities to document lived experiences and priority needs. • Development of gender-focused indicators for evaluating social protection and workplace safety. • Impact assessment of labor laws and welfare schemes on income, health, and education outcomes of salt worker families. • Potential for GIS mapping of salt-producing regions and access to legal/social services. • Evaluation of trade union models and cooperative structures to support collective bargaining in the salt industry.
Source: Author's Own Composition based on Literature [27]	

Table 5: Review-5 showing summary, literature gaps and research potentials regarding salt manufacturing

Category	Details
Paper	“Economics of Salt Production in India: An Analysis”
Author (s)	Dr. B. Nagaraja
Publisher/ Journal	Indian Journal of Applied Research, pp 284-288
Publishing Year	2015
Review Summary	- Provides an integrated economic analysis of salt production, productivity, exports, imports, and consumption trends in India. - Based on secondary data (2011–2014) from government sources (Salt Department, Ministry of Commerce & Industry). - India ranks third globally in salt production; Gujarat, Tamil Nadu, and Rajasthan contribute ~96% of national output. - Reveals labour intensity, seasonal vulnerability, and declining cultivation area utilization (only ~58%). Exports increased significantly (China, Korea, Qatar); however, exports to Japan and Vietnam declined. - Notes declining iodized salt production, stagnating productivity, and migration of workers due to harsh working conditions. - Encourages modernization and mechanization, while emphasizing protection of small-scale producers.
Research Gaps	Lack of primary data and on-the-ground field studies to validate economic findings. - Insufficient exploration of labour market dynamics—no data on wage structures, seasonal unemployment, or gender-specific impacts. - Does not cover technological adoption rates or feasibility of mechanization across different salt-producing regions. - No analysis of environmental sustainability or saline land management issues. - Limited examination of policy implementation efficacy (e.g., government support schemes for small producers). - Misses intersectoral comparisons with similar industries like fisheries or mining.
Research Potentials	- Scope for comparative regional productivity analysis and techno-economic feasibility of mechanization. - Design of microeconomic models to assess salt workers’ incomes, migration patterns, and livelihood diversification. - Detailed evaluation of export competitiveness, including logistics, pricing, and international quality standards. - Studies on sustainability and climate resilience in salt pan ecosystems (e.g., rainwater submergence, pollution). - Assessment of child labor, education, and social mobility in salt-producing communities. - Research on the impact of global demand and trade policies on India's salt sector performance.
Source: Author’s Own Composition based on Literature [19]	

Table 6: Review-6 showing summary, literature gaps and research potentials regarding salt manufacturing

Category	Details
Paper	“A Study on Health Hazard of Salt Workers in Tamil Nadu Coastal Areas”
Author (s)	D. Durairaj & S. Murugan
Publisher/ Journal	International Journal of Pharmaceutical Sciences Review and Research, pp 137-141
Publishing Year	2016

Review Summary	- Focuses on assessing occupational health hazards and working conditions of salt workers in Tuticorin, Ramanathapuram, and Nagapattinam districts. - Based on primary data from 598 respondents using random sampling and statistical methods like Garret Ranking, Regression, and Friedman Test. - Major health problems identified: ophthalmic symptoms, dermatological issues, headache, giddiness, breathlessness, and joint pain. - Confirms lack of modern equipment, outdated techniques, and lack of awareness about safety practices among workers. - Recommends training, safety gear provision, and medical surveillance, alongside government intervention to modernize salt production.
Research Gaps	- No gender-specific analysis despite women's participation in the workforce. Lacks nutritional and mental health assessments (e.g., malnutrition, stress, fatigue). - No analysis of child labor, intergenerational impacts, or access to education. - Limited coverage of policy impacts or evaluation of existing welfare schemes (e.g., NMAY, CRS, TINP). - Did not explore environmental exposure data (e.g., UV index, heat stress levels). - No longitudinal health tracking or correlation with productivity over time.
Research Potentials	- Scope for longitudinal health surveillance studies across multiple seasons or years. - Design of community-based health interventions focused on vision care, skin health, and respiratory wellness. - Development of gender-sensitive frameworks for occupational health in unorganized sectors. - Comparative studies across different salt-producing regions in India to benchmark hazards and protections. - Evaluation of modernization programs (Model Salt Farms) on safety and economic returns. - Use of mobile health (mHealth) or telemedicine solutions for regular checkups in remote salt-producing zones.
Source: Author's Own Composition based on Literature [12]	

Table 7: Review-7 showing summary, literature gaps and research potentials regarding salt manufacturing

Category	Details
Paper	"A Study on Production and Marketing Problems of Small Scale Salt Pan Producers in Tamil Nadu"
Author (s)	S. Murugan & K. Muthalagu
Publisher/ Journal	Paripex - Indian Journal of Research, Vol. 6, Issue 8, pp 532-533
Publishing Year	2017
Review Summary	Focus: Production and marketing problems of small-scale salt pan producers in Tamil Nadu, particularly in Ramanathapuram, Tuticorin, and Nagapattinam. Methodology: Mixed-methods approach with 580 small-scale producers, using simple random sampling, and statistical tools including multiple regression. Key Findings: - Major health issues include eye problems, fungal infections, back pain, allergies, and toxin exposure. - Poor marketing systems, low branding value, and inadequate infrastructure hamper competitiveness. - Workers face extreme physical stress, poor mechanization, and exposure to sunlight and salt dust. - Salt producers lack protective equipment and awareness of occupational safety. Tamil Nadu contributes significantly to India's salt production (~30,000 acres,

	16,500 workers in the study districts).
Research Gaps	• Health Assessment: No biometric/nutritional analysis; lacks data on chronic illnesses or long-term health impact. • Gender and Social Data: No gender-specific data or intersectional lens (caste, income class, educational access). • Environmental Impact: No investigation of land degradation, salinity shifts, or water stress in salt pan zones. • Policy Implementation: Lacks analysis on effectiveness of government schemes (e.g., NMAY, health insurance, labor protections). • Marketing Analysis: No detailed supply chain review or study on pricing mechanisms, intermediaries, or market linkages. • Techno-economic Insight: Limited insights into mechanization feasibility, innovation adoption, or training availability.
Research Potentials	• Occupational Health Studies: Conduct medical screenings, nutrition tracking, and longitudinal studies on salt workers' health and productivity. • Marketing & Value Chain: Research on branding, cooperative marketing models, local-to-global supply chains, and value addition. • Gender & Social Equity: In-depth gendered labor analysis, access to welfare, and reproductive health issues among women salt workers. • Policy and Scheme Evaluation: Evaluate the effectiveness of welfare schemes and safety regulations, identifying bottlenecks and success models. • Environmental Impact Studies: Explore salt pan ecosystem changes, using GIS and satellite data to track spatio-temporal degradation. • Mechanization and Innovation: Pilot studies on low-cost technologies, PPE adoption, and training programs for safer and efficient production.
Source: Author's Own Composition based on Literature [18]	

Table 8: Review-8 showing summary, literature gaps and research potentials regarding salt manufacturing

Category	Details
Paper	"Evaluating Overall Social and Health Status of Salt Workers in Experimental Salt Fields at Bhavnagar, Gujarat, India"
Author (s)	Mayuri Banerjee Bhattacharya
Publisher/ Journal	MOJ Public Health, pp 97–99.
Publishing Year	2017
Review Summary	• The study assesses the health and social conditions of salt workers in experimental fields at Bhavnagar, Gujarat. • Based on a pilot survey conducted in March 2015 with 37 salt workers (men and women). • Highlights prevalent occupational health problems: ophthalmic disorders, musculoskeletal pain, dermatological issues, and respiratory illnesses. • Reveals poor socio-economic conditions: low wages, minimal education, lack of social and health security, substance abuse, poor housing and sanitation. • Notes that female workers are more in number and suffer from additional reproductive health issues. • Workers do not use provided personal protective equipment (PPE) due to lack of awareness and motivation. • Calls for awareness programs and policy attention from government and NGOs.
Research Gaps	• Study limited to a single pilot site (Kumharwada, Bhavnagar); lacks broader regional comparison or scale.

	- No longitudinal follow-up data on health trends or intervention impacts. - Minimal quantitative detail on nutritional status, income analysis, or morbidity patterns. - Limited focus on psychosocial dimensions (e.g., mental health, social stigma, family dynamics). - No exploration of climate-related vulnerabilities (e.g., heat stress, water scarcity). - Inadequate insights on child labor, education dropouts, and intergenerational poverty.
Research Potentials	- Opportunity for multi-state comparative studies on salt worker conditions using standardized tools. - In-depth gender-specific studies on health, wages, reproductive rights, and social roles. - Scope for intervention-based action research—testing health education, PPE adoption, or community health workers. Longitudinal monitoring of occupational health outcomes among salt workers across seasons. - Application of spatial mapping and exposure analysis to assess worksite risk zones. - Collaboration with public health and policy institutions for targeted welfare schemes and labor reforms.
Source: Author's Own Composition based on Literature [4]	

Table 9: Review-9 showing summary, literature gaps and research potentials regarding salt manufacturing

Category	Details
Paper	"History of Salt Industry and Manufacturing in Bengal During the British Period"
Author (s)	Dr. Littan Sarkar
Publisher/ Journal	Research Guru: Online Journal of Multidisciplinary Subjects (Peer Reviewed), pp 506-523
Publishing Year	2018
Review Summary	- The article provides a comprehensive historical account of the development, monopoly, decline, and attempted revival of the salt industry in Bengal Presidency under British colonial rule. - It highlights the economic and social significance of the salt trade, particularly in coastal Bengal (Hijlee, Tamruk, Ingelee). - The work draws from primary archival records and integrates socio-economic insights regarding laborers (Malangis), production systems, government policies, and trade networks. - Describes colonial exploitation, excise and monopoly systems, and labor oppression. - Ends with a contemporary overview of post-independence salt industries and their challenges.
Research Gaps	Lack of quantitative economic analysis of salt industry contribution to colonial economy. Insufficient environmental impact assessment related to salt manufacturing and land use changes. - Minimal analysis of gender roles or caste dynamics in salt labor organization. - Does not extensively explore technological evolution in salt production over time. - Limited comparative study with other salt-producing regions in India or globally. - Weak linkage between salt industry decline and wider socio-political movements, beyond brief mention of Gandhian Satyagraha.
Research Potentials	- Scope to integrate spatial GIS-based analysis of salt pans and economic zones in Bengal's coastal belt. - Opportunity to examine ecological degradation and landscape transformation due to salt production. - Potential for oral history projects with descendants of Malangis or salt workers. - Comparative analysis of Bengal's salt economy with that of Madras or Gujarat. - Application of economic history models to evaluate fiscal impacts of salt taxation.

- Revival strategies for traditional salt industries as a part of **sustainable rural livelihoods** and **heritage conservation**.

Source: Author's Own Composition based on Literature [28]

Table 10: Review-10 showing summary, literature gaps and research potentials regarding salt manufacturing

Category	Details
Paper	"Socio-Economic and Nutritional Status in 'Agariyas': Salt Cultivators' Work as Contractual Manpower in Organized Salt Industries"
Author (s)	Mayuri Banerjee Bhattacharya, S. C. Upadthay & Arvind Kurmar
Publisher/ Journal	International Journal of Applied and Natural Sciences (IJANS), pp 69-84
Publishing Year	2018
Review Summary	• Study focuses on Agariyas (salt cultivators) in Bhavnagar, Gujarat working in organized salt industries. • Used an advanced mixed-method design (qualitative + quantitative) with 166 participants. • Assessed nutritional status using anthropometric measures (BMI, MUAC, WHR), socio-economic parameters, and access to basic amenities. • Key findings: 25.3% underweight (Chronic Energy Deficiency), low hemoglobin levels (males: 11.5 g/dl, females: 9.6 g/dl), poor sanitation, open defecation, inadequate food diversity. • Reported poor use of PPEs despite awareness of occupational hazards. • Reveals systemic exclusion from health insurance and social protection, particularly for migratory laborers.
Research Gaps	• Limited long-term or seasonal dietary intake patterns and food security data. • Absence of biochemical markers (other than hemoglobin) for comprehensive nutritional profiling. • No intervention-based evaluation of nutritional improvement programs or PPE usage training. • Lacks comparison with urban or differently organized salt industries in other Indian states. • Insufficient data on psychosocial stressors, mental health, or work-related injuries. • No analysis of impact of malnutrition on productivity, fatigue levels, or absenteeism.
Research Potentials	• Detailed longitudinal tracking of nutritional and health outcomes among salt workers across seasons. • Comparative research between migratory and local salt workers or organized vs unorganized setups. • Development and testing of nutritional intervention models—e.g., fortified meal programs or food vouchers. • Use of GIS and spatial analysis to assess settlement proximity to healthcare, water sources, and environmental hazards. • Policy evaluation studies on inclusion of Agariyas in welfare schemes like ESI, PDS, and nutrition missions. • Behavioral research on barriers to PPE usage, sanitation habits, and healthcare-seeking behavior.

Source: Author's Own Composition based on Literature [5]

Table 11: Review-11 showing summary, literature gaps and research potentials regarding salt manufacturing

Category	Details
Paper	"A Study on the Working Condition of Salt Pan Workers in Thoothukudi"
Author (s)	S. Prakash & Dr. N. Maria Nevis Soris
Publisher/	International Journal of Science, Engineering and Management (IJSEM), pp 545-548

Journal	
Publishing Year	2018
Review Summary	- The study investigates the working and socio-economic conditions of salt pan workers in Thoothukudi, Tamil Nadu. - Based on primary data from 120 respondents collected via interviews using convenience sampling. - Reports that 91% of workers suffer from occupational diseases, with 43% experiencing both skin and eye issues. - Most workers are illiterate (59%), married (78%), and earn between ₹5000–8000/month (48%). Scraping (34%) is the most common activity; 66% work 8-hour days, with over 33% having >12 years of experience. - Finds no significant relationship between education level and opinion about the job (Chi-square test). - Concludes that job security, safety equipment, and disaster compensation are critically lacking.
Research Gaps	- The study relies on a small sample size (120), limiting generalizability across regions. - No detailed health assessments (e.g., biometric or clinical indicators) or tracking of chronic illnesses. No gender-specific analysis, despite nearly half the respondents being women. - Lacks insights into child labor, education access, or intergenerational livelihood patterns. - Limited exploration of policy impact—schemes like NMAAY or off-season assistance not assessed. Environmental or climatic exposure factors are not measured or correlated with health outcomes.
Research Potentials	- Potential for a large-scale, stratified survey across Tamil Nadu salt belts for better representation. - Incorporate health diagnostics and nutritional profiling to link work conditions with physical health outcomes. - Conduct gender-disaggregated studies to explore occupational challenges for women salt workers. - Develop seasonality-based labor vulnerability models including migration, income fluctuations, and debt cycles. - Use policy evaluation frameworks to assess delivery and effectiveness of welfare schemes and protective laws. - Application of geospatial tools to analyze workplace hazard zones and access to services like water, shade, and clinics.
Source: Author's Own Composition based on Literature [22]	

Table 12: Review-12 showing summary, literature gaps and research potentials regarding salt manufacturing

Category	Details
Paper	“Freedom Struggle in India: Midnapore, 1905–1934”
Author (s)	Sanjib Bera
Publisher/ Journal	Pramana Research Journal, pp 438-447
Publishing Year	2019
Review Summary	- The article explores the role of Midnapore district in India's freedom struggle between 1905 and 1934. - Covers major movements: Anti-Partition (1905), Non-Cooperation (1920–22), and Civil Disobedience (1930–34). - Highlights the emergence of nationalism, participation of women, students, and local

	leaders in organized protests. - Discusses the contribution of revolutionary activities, including bomb-making, political assassinations, and underground groups. - Chronicles grassroots mobilization like Salt Satyagraha in Tamluk and Contai, establishment of national schools, Khadi centers, and women-led movements. - Uses both archival records and historical references to establish a rich narrative of resistance in rural Bengal.
Research Gaps	- Lacks quantitative data or statistical analysis of participation, casualties, or regional impact. - Insufficient exploration of the socio-economic background (class, caste, occupation) of participants. - Limited focus on internal dissent or ideological splits within the freedom movement (e.g., Gandhian vs. revolutionary wings). - Does not provide comparative analysis with other key districts involved in the freedom movement. No examination of the British response (policy-wise or militarily) at the local level. - Absence of environmental or economic impact assessment related to salt production and land use.
Research Potentials	- Scope for GIS-based mapping of revolutionary centers, protest routes, and Salt Satyagraha camps in Midnapore. - Opportunity for oral history documentation of families of lesser-known freedom fighters, especially women. - Can expand into a comparative regional study (e.g., comparing Midnapore's movement with those in Bardhaman or Birbhum). - Analysis of British surveillance, policing tactics, and administrative reports during unrest. - Potential to investigate economic impact of Swadeshi and boycott movements in rural Bengal markets. - Can inform curriculum development for regional history in school textbooks and museums.
Source: Author's Own Composition based on Literature [3]	

Table 13: Review-13 showing summary, literature gaps and research potentials regarding salt manufacturing

Category	Details
Paper	"Health Impact on Salt Workers in Kanyakumari District"
Author (s)	S. Rekha & Dr. A. Anandhy
Publisher/ Journal	Journal of Emerging Technologies and Innovative Research (JETIR), pp 529-536
Publishing Year	2019
Review Summary	- The study assesses occupational health-related problems among salt workers in Kanyakumari district, Tamil Nadu. - Based on primary data from 93 workers using structured interviews and statistical analysis (including multiple regression). - Identifies major health issues: cataract (88.17%), underweight (82.79%), and dermatitis (86.02%). - Regression analysis reveals that ophthalmic symptoms, joint pain, and dermatological issues significantly reduce household savings. Safety and welfare measures (gloves, boots, caps, spectacles, bonus, medical allowance, job security) were largely inadequate. - Highlights that improving health and safety conditions would enhance worker productivity and salt output.
Research Gaps	- Study limited to a single year and district; lacks seasonal or longitudinal insights. - No exploration of mental health, psychosocial stress, or substance abuse among

	workers. • Environmental or climate-related factors (e.g., heat, flooding) not assessed. • Lacks analysis of women-specific health challenges or gender-based wage/access disparities. • Does not explore children's welfare, access to education, or intergenerational livelihood continuity. • Absence of linkage to macro-level policy analysis or comparative district/state frameworks.
Research Potentials	• Potential for multi-district/state comparative studies on salt worker health and welfare. • Scope to analyze gender-based vulnerabilities and reproductive health issues. • Longitudinal studies on health-savings-productivity linkages in salt industry. • Policy-oriented research to assess implementation of national schemes like NMAY, ESI, or PF. • Impact evaluation of health and safety interventions (e.g., PPE distribution, mobile clinics). • GIS-based spatial mapping of salt pans, hazard zones, and access to public services.
Source: Author's Own Composition based on Literature [24]	

Table 14: Review-14 showing summary, literature gaps and research potentials regarding salt manufacturing

Category	Details
Paper	"Assessment of Hydrographic Variables of Salt-Pans Water of Mumbai, West Coast of India"
Author (s)	Dr. Anis A. B. Choudhery & Miss Simeen Rumani
Publisher/Journal	Journal of Hydrogeology & Hydrologic Engineering, pp 1-8
Publishing Year	2021
Review Summary	• The study investigated monthly variation of hydrographic variables across five zones (R1–R5) in Mumbai salt pans from Nov 2013 to Jun 2014. • Parameters studied include temperature, salinity, pH, DO, CO₂, BOD, nitrate, nitrite, phosphate, and silicate. • Found that temperature and salinity are dominant negative influencers of nutrient and oxygen availability. • Recorded extreme environmental variation, with salinity rising from 22 ppt to 556 ppt and temperature from 26°C to 53°C. • Strong negative correlation of salinity and temperature with other parameters; positive correlations among DO, CO₂, and nutrients. • Highlights the ecological uniqueness of hypersaline salt pan systems and their relevance for aquaculture and blue economy.
Research Gaps	• Lacks biological community data (e.g., plankton, benthos, fish) to connect abiotic changes to ecological impacts. • No temporal comparison with other seasons or years (limited to a single salt-production cycle). • Anthropogenic influence (e.g., pollution, sewage runoff) only briefly mentioned without quantified data. • No direct linkage to socio-economic dimensions of salt workers or impact on local livelihoods. • Did not explore the effect of climate change factors such as rainfall variability or sea-level rise. • Absence of management framework for ecological restoration or pollution mitigation.
Research Potentials	• Expand to a multi-year study for tracking long-term ecological change and climate variability impacts. • Incorporate ecological indicators like phytoplankton, benthos, or microbial

	communities. • Study potential of reclaimed or abandoned salt pans for biodiversity conservation or eco-tourism. • Develop a pollution source-mapping model for nearby urban runoff and sewage impacts. • Investigate sustainable aquaculture models in zones with favorable nutrient conditions (R1–R3). • Scope for GIS-based zonation of salt pan ecosystem health and potential integration in Mumbai’s coastal planning.
Source: Author’s Own Composition based on Literature [9]	

Table 15: Review-15 showing summary, literature gaps and research potentials regarding salt manufacturing

Category	Details
Paper	“The Salt Industry in Transition: Labour, Environment and Indigenous Participation, ca. 1757–1800”
Author (s)	Baijayanti Chatterjee
Publisher/ Journal	RetailHistory: CHORD blog, pp 1-5
Publishing Year	2021
Review Summary	• The article presents a nuanced examination of the transformation of Bengal’s salt industry between 1757 and 1800—a period marking the rise of British colonial dominance. • The study underscores how the industry’s transition was driven by intersecting economic, political, and environmental forces. Indigenous production systems that once thrived under decentralized structures, especially involving malangis (traditional salt workers), were significantly disrupted as the East India Company imposed monopolistic control through contract and agency systems. • The restructuring of labor—shifting from communal and hereditary work systems to regulated, revenue-centric modes—reflected broader shifts in colonial governance. • Simultaneously, the study highlights how environmental conditions such as seasonal flooding and soil salinity played a critical role in defining the geographies and rhythms of salt production. Despite these pressures, indigenous participation persisted, albeit in diminished and altered forms. • Ultimately, the article argues that salt, once a community-managed livelihood activity, evolved into a crucial fiscal commodity under colonial rule, serving as a major source of revenue and exploitation. The work bridges labor history, environmental change, and economic transformation, offering a vital lens into the colonial disruption of local industries and indigenous agency.
Research Gaps	• Limited empirical data on everyday life, resistance, and adaptation strategies of salt workers under colonial control. • Scant focus on gendered labour roles in salt manufacturing. • Lack of environmental impact assessment of colonial salt extraction methods. • Underexplored comparison with other coastal salt-producing regions in India. • Minimal engagement with post-1800 transformations and continuity of indigenous systems.
Research Potentials	• Possibility to investigate salt labour within the broader framework of subaltern studies and environmental history. • Comparative analysis of salt industry labour structures across different presidencies (e.g., Madras, Bombay vs. Bengal). • Scope to examine archival judicial, revenue and personal records for micro-histories of malangis. • Integration of environmental science to assess long-term ecological impacts of salt production. • Linking to global commodity history of salt.

Table 16: Review-16 showing summary, literature gaps and research potentials regarding salt manufacturing

Category	Details
Paper	"Salt Industry in Colonial Bengal"
Author (s)	Md. Rezaul Karim
Publisher/Journal	IBS Journal, Bangladesh, vol. 13, pp 35-54
Publishing Year	2022
Review Summary	- The article provides a historical overview of the salt industry in Bengal under colonial rule, with emphasis on state control and revenue extraction. - Explains how British colonial authorities established a salt monopoly by suppressing indigenous production and regulating supply through licensing and transit duties. - Emphasizes the economic motivations behind salt taxation and how it served as a major source of revenue for the colonial state. - Discusses the role of the East India Company, British administrators, and the implementation of excise systems to replace decentralized production.
Research Gaps	- Lacks micro-level analysis of salt workers' socio-economic conditions, including caste, class, and gender roles. - Does not address the environmental consequences of salt production (e.g., deforestation, wetland alteration). - Limited discussion on local resistance to colonial salt laws and on the cultural-symbolic meanings of salt in Bengali society. - Missing comparative regional data across other salt-producing zones in India. - Overlooks long-term livelihood transformations following the industry's decline.
Research Potentials	- Opportunity to study subaltern labor histories of malangis, local traders, and women in salt-producing communities. - Potential for interdisciplinary research linking salt production to land-use change, coastal ecology, and rural marginalization. - Comparative work on colonial commodity monopolies (e.g., opium, indigo, salt) and their socio-political impacts. - Analysis of the role of salt in anti-colonial protest, particularly pre-Gandhian forms of local resistance. - GIS-based mapping of salt tracts and trade routes in colonial Bengal.

Source: Author's Own Composition based on Literature [16]

Table 17: Review-17 showing summary, literature gaps and research potentials regarding salt manufacturing

Category	Details
Paper	"Extracting Empire: Changing Visions of Labor and Environment in Bengal's Salt Industry"
Author (s)	Julia Fine
Publisher/Journal	Environmental History Now
Publishing Year	2022
Review Summary	- The article explores how colonial capitalism transformed labor and environmental systems in Bengal's salt industry. - It highlights the shift from hereditary adjoorah labor systems to exploitative thika contract systems under the British East India Company. - Working conditions for malangis (salt laborers) deteriorated, marked by long hours, exposure to disease and tiger attacks, and high fatality rates. - The colonial state's exploitation of forest resources for fuel and its reclamation of salt-

	producing lands led to ecological degradation. • Closure of saltworks post-1862 coincided with a shift to imported British salt and helped spark anti-colonial movements like Gandhi's Salt March.
Research Gaps	• Lack of longitudinal socio-ecological data on changes in land use and salt production impacts over time. • Inadequate focus on gendered labor roles and the experiences of women and children in salt-producing households. • Insufficient micro-historical narratives from worker perspectives (e.g., diaries, oral histories). • Limited integration of multispecies and ecological history (e.g., tiger-human interactions, mangrove degradation). • Gaps in comparative frameworks linking Bengal's salt industry with other colonial commodity frontiers.
Research Potentials	• Interdisciplinary studies connecting labor history, environmental history, and political economy of colonial industries. • Use of GIS and environmental reconstruction to map fuel land degradation and salt bed transformation. • Archival and ethnographic research on salt labor heritage, including descendant communities of malangis. • Examination of climate vulnerabilities and labor precarity in extractive industries across colonial South Asia. • Linking environmental injustice in colonial saltworks to contemporary environmental labor movements and resilience narratives.
Source: Author's Own Composition based on Literature [13]	

Table 18: Review-18 showing summary, literature gaps and research potentials regarding salt manufacturing

Category	Details
Paper	"Socioeconomic Problems of Marginal Salt Producers – A Study with Reference to Tamil Nadu"
Author (s)	Robin Brahma & Dr. Bushan D. Sudhakar
Publisher/ Journal	Journal of Positive School Psychology, pp 5029 – 5031
Publishing Year	2022
Review Summary	• The study examines socioeconomic challenges of marginal salt producers (holding <10 acres) in Tamil Nadu. • Uses empirical data collected via questionnaires and interviews and analyzed using SPSS. • Finds education, family size, and work experience significantly influence production issues, while gender, age, and marital status are not statistically significant. • Highlights core challenges: low productivity, lack of market access, falling prices, rainwater-induced quality degradation, lack of financial access, and regulatory constraints. • Reveals a declining trend in marginal producers and closing of small salt production units in Tamil Nadu despite overall national growth in salt production.
Research Gaps	• Small sample size limits generalizability to all marginal producers in Tamil Nadu or other regions. • Lacks gender-disaggregated analysis of production issues and access to markets/resources. • Does not assess climate change impacts or environmental vulnerabilities in salt-producing areas. • Absence of policy analysis on subsidies, training programs, or formal credit access schemes. • No exploration of supply chain dynamics or the role of intermediaries in market exploitation.

	Limited insights on post-harvest infrastructure like storage and transport.
Research Potentials	Expanded regional surveys across Tamil Nadu and other coastal states to generalize and compare issues among marginal salt producers. - In-depth study on gendered access to resources and decision-making within salt producer families. Impact evaluation of modernization initiatives and feasibility of mechanization among marginal producers. - Policy-oriented research on financial inclusion, access to credit, and micro-insurance for salt producers. Geospatial and environmental analysis to assess effects of rain, pollution, and industrial proximity. - Studies linking socioeconomic vulnerability to sustainability and long-term viability of marginal salt production.
Source: Author's Own Composition based on Literature [6]	

Table 19: Review-19 showing summary, literature gaps and research potentials regarding salt manufacturing

Category	Details
Paper	"Salt Tax and Salt Administration in Colonial India: A Study"
Author (s)	Dr. R. Balaji
Publisher/ Journal	Nilam International Research Journal of Arts and Culture, Vol. 4, Issue 2, pp 66-87
Publishing Year	2023
Review Summary	- The article presents an extensive historical account of the salt tax policy and administrative mechanisms used by British colonial authorities in India from the late 18th century to Independence. - Highlights the monopolization of salt by the East India Company and how salt revenue became a key component of colonial finance. - Describes various forms of salt taxation (excise, customs, transit duties) and the infamous Inland Customs Line (Great Hedge of India) used to curb smuggling. - Discusses public opposition, Indian National Congress protests, and Gandhi's Salt Satyagraha. - Traces post-colonial changes and bureaucratic restructuring in the salt department.
Research Gaps	- Lacks regional labor histories (e.g., malangis, women workers) and their living/working conditions. - Limited quantitative data analysis (e.g., correlation between tax rates, salt prices, and consumption patterns). - Inadequate assessment of health impacts due to salt scarcity and poor nutrition (e.g., cholera, iodine deficiency). - Sparse coverage of environmental and ecological consequences of salt extraction methods and custom hedges. - No comparative perspective with salt policies in other British colonies or other empires.
Research Potentials	- Detailed regional microhistories of salt production zones like Madras, Gujarat, Odisha, and Punjab. - Interdisciplinary research combining public health, political economy, and colonial taxation systems. - Exploration of subaltern voices and resistance beyond elite Congress narratives (e.g., village-level revolts, peasant salt raids). - Use of GIS and historical cartography to reconstruct the physical path of the Inland Customs Line and analyze trade disruption. - Comparative study with global salt monopolies (e.g., China's Shang-yun system or France's gabelle).
Source: Author's Own Composition based on Literature [1]	

Table 20: Review-20 showing summary, literature gaps and research potentials regarding salt manufacturing

Category	Details
Paper	“Exploring the Economic and Health Status of Salt Pan Workers in Tuticorin District”
Author (s)	M. Sagunthala & Dr. K. Sadasivam
Publisher/ Journal	TIJER - International Research Journal, pp 250-258
Publishing Year	2023
Review Summary	- Investigates socio-economic and health conditions of salt pan workers in Tuticorin District, Tamil Nadu. - Covers working conditions, living conditions, gendered vulnerabilities, health issues (ophthalmic, musculoskeletal, dermatological), and impact of seasonal employment. - Highlights poor wages, job insecurity, harassment (especially of women), lack of basic amenities, and exploitative lending practices. - Reports significant occupational health hazards due to heat, salt exposure, dehydration, and lack of PPE. - Discusses government schemes like Namak Mazdoor Awas Yojana, Saltpan Cluster Development Programme, and Rs. 5000 off-season support. - Stresses the role of NGOs, health camps, tripartite committees, and policy recommendations for improving worker well-being.
Research Gaps	- Absence of primary data analysis—relies mostly on secondary literature and qualitative synthesis. - Lacks quantitative health impact assessments and nutritional profiling (e.g., BMI, haemoglobin levels). - No detailed economic productivity analysis linking income, wages, and family expenditures. - Minimal focus on children’s education, intergenerational mobility, and dropout patterns. - Does not explore environmental degradation quantitatively (e.g., salt brine pollution, salinity spread). - Needs intersectional analysis (gender, caste, region) to understand compounded vulnerabilities.
Research Potentials	- Scope for primary field studies using mixed methods to validate findings through worker surveys. - Design and implementation of intervention trials (e.g., PPE use, nutrition programs, hydration protocols). GIS-based mapping of salt pan settlements and infrastructure (water access, clinics, schools). - Evaluation of government scheme efficacy (e.g., housing, insurance, iodine programs). - Studies on women's empowerment, access to reproductive health, and prevention of harassment at salt works. - Potential for policy research and advocacy to include salt pan workers under broader labor welfare and social security acts.

Source: Author’s Own Composition based on Literature [26]

Table 21: Review-21 showing summary, literature gaps and research potentials regarding salt manufacturing

Category	Details
Paper	“Social and Legal Welfare of Women Workers at Salt Pan Industry in Thoothukudi District, Tamil Nadu – An Analytical Study”
Author (s)	Suyambulingam S., Sumathi S. & Ramanya Gayathri M.
Publisher/ Journal	Innovations, pp 99-109
Publishing	2023

Year	
Review Summary	- Focuses on the working conditions, legal rights, and social protection of women salt pan workers in Thoothukudi, Tamil Nadu. - Highlights key issues: low wages, gender-based discrimination, poor access to healthcare, and weak implementation of labor laws. - Uses primary data from 187 women across 10 taluks, employing cluster sampling. - Discusses various government schemes (PMJDY, PMKVY, DAY, CM Health Insurance, TAHDCO housing, TINP, TNRLM, TNREGS, etc.). - Notes that although some employers provide safety equipment, awareness and implementation of schemes like Neithal and CRS remain poor. - Reinforces that most workers are aged 40+, work early mornings, and earn below parity wages compared to male counterparts. - Summarizes relevant national legislations and international conventions applicable to women's labor rights.
Research Gaps	- Lacks quantitative health impact analysis or biometrics (e.g., morbidity, nutrition, occupational disease). - No assessment of intersectionality (e.g., caste, class, age) influencing vulnerabilities of women workers. - Does not evaluate effectiveness of government schemes with measurable outcomes. - Limited longitudinal or comparative analysis across different districts or states. - Insufficient focus on mental health, reproductive rights, and workplace harassment case studies. - No exploration of children's well-being, intergenerational labor patterns, or dropout rates in salt worker families.
Research Potentials	- Scope for multi-district or cross-state comparative studies on welfare impacts and legal protections. - Conduct impact evaluation of specific schemes (e.g., PMJDY, DAY, TNREGS) using measurable KPIs. Gender audit studies focusing on wage disparity, safety practices, and legal awareness among women workers. - Opportunities for GIS-based mapping of infrastructure access (clinics, drinking water, toilets) in salt pan zones. - Potential for participatory action research involving women in co-designing safety, nutrition, and awareness interventions. - Incorporate legal ethnography to study the lived experience of accessing justice and entitlements by salt pan women.
Source: Author's Own Composition based on Literature [32]	

Table 22: Review-22 showing summary, literature gaps and research potentials regarding salt manufacturing

Category	Details
Paper	"The Ungrudging Indian: The Political Economy of Salt in India, c. 1878–1947"
Author (s)	Miles Taylor
Publisher/ Journal	South Asia: Journal of South Asian Studies, 46:4, pp 791-805
Publishing Year	2023
Review Summary	Focus: The article explores the British colonial salt monopoly, the socio-political implications of salt taxation, and why salt became a symbol of protest only by 1930 under Gandhi. Key Themes: Salt monopoly as an extractive yet minimally resisted colonial policy. - Operation, taxation, and revenue models of salt from 1878 to 1947. - The emergence of salt as political symbolism during Gandhi's Salt March. - Role of Indian salt merchants, nationalist economy, and post-1930 reforms. Major Arguments:

	- British control over salt involved coercion, surveillance, and high taxation, but resistance remained sporadic until Gandhi. - Salt was not central to famine conditions unlike rice/wheat but symbolized colonial overreach. - Post-1920s decline in British imports and rise in Indian salt manufacturing lobby led to economic nationalism. - The Delhi Pact (1931) allowed minor reforms, but the monopoly endured until its abolition in 1947.
Research Gaps	Regional Comparisons: Limited comparative study of regional salt economies (e.g., Bengal, Madras, Gujarat) and their differential impact. Worker-Centric Perspective: Focused largely on policy and political economy, with less emphasis on labor history, health, and lived experiences of salt workers. Ecological Impact: Neglect of environmental consequences of salt pan operations, saline water expansion, and coastal degradation. Subaltern Resistance: The article addresses elite nationalist movements but gives less attention to micro-resistance and grassroots dissent before 1930. Postcolonial Continuities: The discussion of continuity of monopolistic tendencies post-independence (e.g., Tata Salt, Salt Cess) is brief and underdeveloped.
Research Potentials	Subaltern & Labor Histories: Oral histories and archival research on salt workers, especially in Bengal and Gujarat, can offer bottom-up narratives. Environmental History: Study ecological legacy of salt extraction on coastal ecosystems—land use change, salinity intrusion, wetland degradation. Comparative Colonial Studies: Compare the salt monopolies in India, Egypt, Burma, or French Indochina for transcolonial insights. Postcolonial Economic Policy: Examine nationalization vs. liberalization of the salt industry and evolution of corporate monopolies post-1947. Symbolism & Memory: Explore how the Salt March has been commercialized or appropriated in Indian nationalism and popular culture. Policy Continuities: Evaluate contemporary salt policy, subsidies, labor conditions, and branding (e.g., iodization vs. traditional salt).
Source: Author's Own Composition based on Literature [33]	

Table 23: Review-23 showing summary, literature gaps and research potentials regarding salt manufacturing

Category	Details
Paper	“An Analysis of the Salt Industry in Coastal Region of Midnapore District in the Nineteenth Century: The Emergence, Development and Gradual Decay”
Author (s)	Lakshman Chandra Ojha
Publisher/ Journal	International Journal for Multidisciplinary Research (IJFMR), pp 1-9
Publishing Year	2023
Review Summary	- The paper provides a historical account of salt production in Midnapore, West Bengal, from the Mughal to British periods. - Highlights the role of indigenous salt workers (Malangis)—Ajoora and Thika types—and their socio-economic conditions. - Shows how the British East India Company monopolized the salt trade, replacing traditional decentralized systems. - Discusses infrastructure like khalaris, jalpai lands, and golahs. - Demonstrates how political control, revenue greed, and neglect led to industrial decline by the end of the 19th century.
Research Gaps	- Insufficient micro-level socio-economic profiling of malangis and their households. - Lack of quantitative data on production, trade volumes, and profit-loss analysis across periods.

	- Limited exploration of women's roles in the salt economy. - Absence of spatial mapping of khalaris, jalpais, and salt-producing zones. - Impact of ecological/environmental changes (e.g., sea level rise, salinity shift) not explored.
Research Potentials	- Scope for GIS-based mapping of historic salt production zones and land use changes. - Ethnographic and oral histories from descendants of malangis could enrich socio-cultural perspectives. - Comparative study between British and Mughal salt revenue policies. - Interdisciplinary research on the environmental history of coastal Bengal in relation to salt industries. - Assessment of legacy effects of salt pan economies on modern coastal livelihoods.
Source: Author's Own Composition based on Literature [20]	

Table 24: Review-24 showing summary, literature gaps and research potentials regarding salt manufacturing

Category	Details
Paper	"Salt Trade and Trading Centres of South West Bengal (18th Century)"
Author (s)	Manasi Jana
Publisher/ Journal	RESEARCH REVIEW: International Journal of Multidisciplinary, pp 160-163
Publishing Year	2024
Review Summary	- The paper explores the salt trade in South West Bengal during the 18th century, emphasizing key centers like Hijli, Tamluk, and Mahishadal. - It outlines the transition of salt trade control from local zamindars under the Nawabs to British East India Company monopoly post-1760. - Highlights the role of Malangis (salt workers), especially Ajoora and Thika types, and their gradual marginalization. - Discusses production methods (pungah and karkatch), infrastructure (khalaris, golahs), and agency systems. - Emphasizes salt's significance in local livelihoods and colonial revenue policies.
Research Gaps	- Lack of detailed socio-economic profiling of salt workers, especially the Ajoora Malangis' family-based labor structure. - Minimal discussion on the gender division of labor and roles of women in salt production. - Limited analysis of environmental degradation due to salt manufacturing (e.g., impact on Jalpai lands). - Absence of visual/cartographic representation of salt production networks. - Inadequate linkage to broader maritime or inland trading networks and comparative historical cases.
Research Potentials	- Potential to conduct GIS-based spatial mapping of salt production sites (e.g., Hijli, Tamluk, Mahishadal) and trade routes. - Archival research on correspondence, ledgers, and maps from salt agencies for micro-history of salt economy. - Opportunity to integrate oral histories from descendants of salt workers to recover subaltern narratives. - Cross-regional comparative study with salt industries of Orissa, Tamil Nadu, or Gujarat. - Environmental history of salt landscapes in relation to livelihood and colonial policies.
Source: Author's Own Composition based on Literature [15]	

Table 25: Review-25 showing summary, literature gaps and research potentials regarding salt manufacturing

Category	Details
----------	---------

Paper	“An Assessment of the Performance Evaluation of the Salt Industry in India with Special Reference to the State of Gujarat”
Author (s)	Ashok Panigrahi, Sukanta Sarkar & Suman Kalyan Chaudhury
Publisher/ Journal	Journal of Management Research and Analysis; 11(4): pp 229–237
Publishing Year	2024
Review Summary	• Focus: Comprehensive evaluation of the production, export-import trends, financial viability, and challenges of India’s salt industry with a special focus on Gujarat. • Data & Methodology: Utilizes descriptive statistics, regression analysis, and secondary data (2002–2023) from the Salt Department, Govt. of India. • Key Findings ▪ Gujarat contributes ~60–70% of India’s salt production. ▪ Positive relationship between salt production and export, but no strong relation with imports. ▪ Sea salt is dominant, inland sources matter in Rajasthan. ▪ Decline in salt production post-2020 due to climate change, unseasonal rains, and pandemics. ▪ Salt exports are significantly higher in value than imports, confirming strong trade surplus. ▪ Gujarat’s cooperatives and Agariyas play key roles in sustaining production.
Research Gaps	• Worker Welfare: Minimal analysis of health risks, labor rights, or social protection for salt workers despite identifying their vulnerability. • Climate Change Impact: Lacks scientific environmental data or modeling to quantify impact of climate events (e.g., cyclones, floods) on salt yields. • Gender & Social Stratification: No assessment of gendered labor division, caste-based access to production or ownership among Agariyas. • Technology & Productivity: Sparse detail on mechanization levels, innovation adoption, or modern productivity enhancement in small units. • State Comparison: Gujarat is emphasized, but limited comparative depth with other states (e.g., Tamil Nadu, Odisha, West Bengal, Goa). • Policy Impact Evaluation: Government schemes (e.g., insurance, housing, quality control) are noted, but effectiveness is not statistically analyzed.
Research Potentials	• Occupational Health & Safety: Field-based studies on worker conditions, access to healthcare, and sanitation in major salt-producing states. • Climate-Resilient Production: Integrating climate risk assessment models and sustainable salt farming techniques (e.g., bund maintenance, water flow modeling). • Gender Studies & Social Equity: Investigate female labor participation, wage disparities, and intergenerational continuity in Agariya communities. • Techno-economic Feasibility: Pilot cost-benefit analysis of mechanized salt production systems among cooperative societies and SMEs. • Comparative State Analysis: Detailed spatio-economic comparisons of production trends, export policies, and productivity across Gujarat, Tamil Nadu, Odisha, etc. • Supply Chain Optimization: Mapping of port-to-market networks, quality control regimes, and transport bottlenecks in the salt export chain.
Source: Author’s Own Composition based on Literature [21]	

9. Statistics of Reviewed Literatures:

Table 26: Spatial Level of Reviewed Literatures			
Level of Reviewed Literatures	Area Coverage (Spatial Extension)	Number of Reviewed Literatures	% of Reviewed Literatures
Local Level	Mandarmani Stretch & Ramanagar	0	0.00

	Coastal Region		
Regional Level	Contai as well as Midnapore Coastal Region	04	11.76
State Level	West Bengal Coastal Region	05	14.71
National Level	Indian Coastal Region	21	61.76
International Level	Outside India	04	11.76
Total		34	100.00
Source: Author's Own Composition based on Literature Review, 2025			

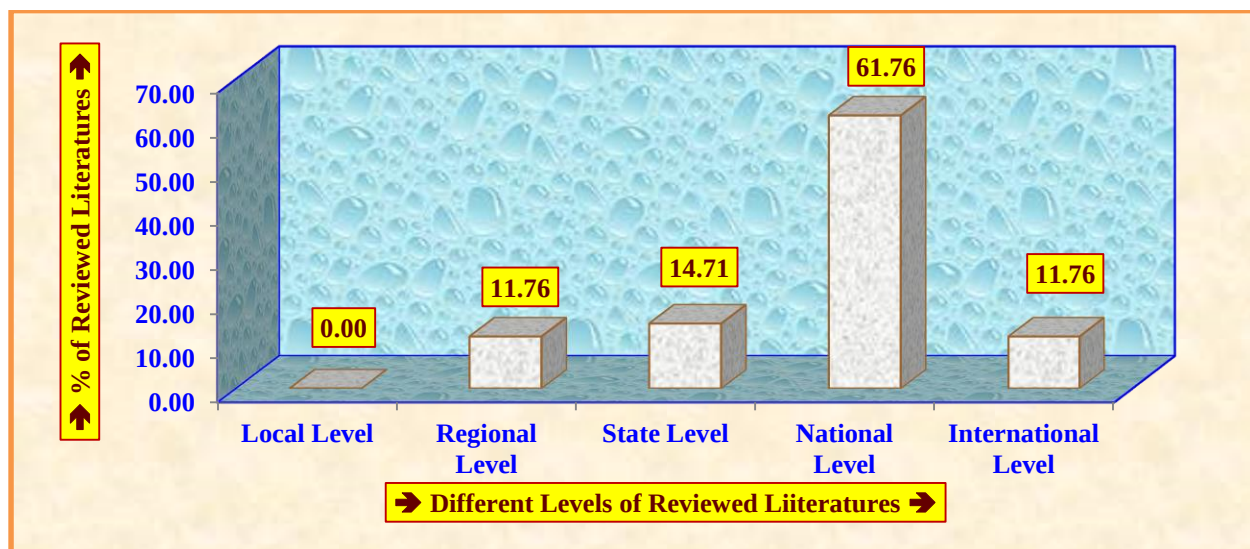


Figure 5: Types of Sources of Reviewed Literatures

Table 27: Types of Sources of Reviewed Literatures		
Types of Sources of Reviewed Literatures	Number of Reviewed Literatures	% of Reviewed Literatures
Individual Source	1	2.94
Institutional Source	03	8.82
Organizational Source	04	11.76
Web Source	26	76.47
Total	34	100.00
Source: Author's Own Composition based on Literature Review, 2025		

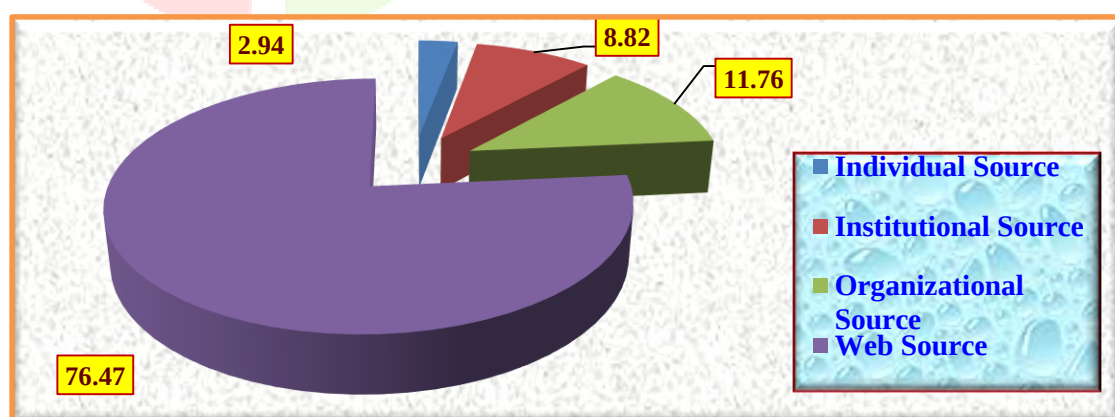


Figure 6: Source Availability of Reviewed Literatures

Table 28: Source Availability of Reviewed Literatures		
Types of Source Availability of Reviewed Literatures	Number of Reviewed Literatures	% of Reviewed Literatures
Published Offline: Open Availability	02	5.88
Published Offline: Restricted Availability	07	20.59
Published Online: Availability (Open Access)	18	52.94

Published Online: Availability (Restricted Access)	06	17.65
Unpublished Unavailability with Individual Privacy & Restriction	1	2.94
Total	34	100.00

Source: Author's Own Composition based on Literature Review, 2025

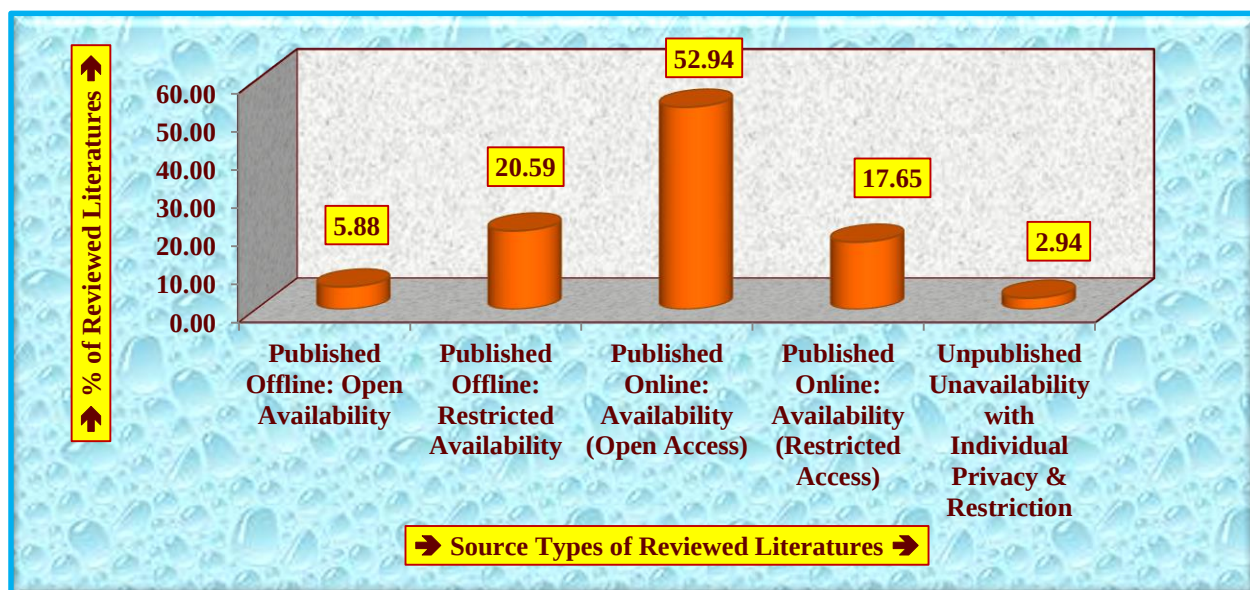


Figure 7: Statistics of the Source Types of Reviewed Literatures

Table 29: Statistics of the Forms of Reviewed Literatures		
Forms of Reviewed Literatures	Number of Reviewed Literatures	% of Reviewed Literatures
Books	03	8.82
Research Papers & Articles	21	61.76
Synopsis & Thesis	01	2.94
Institutional Reports, Handbooks & Gazetteers	07	20.59
Writings in Local/ Regional Magazines/ Periodicals	02	5.88
Total	34	100.00

Source: Author's Own Composition based on Literature Review, 2025

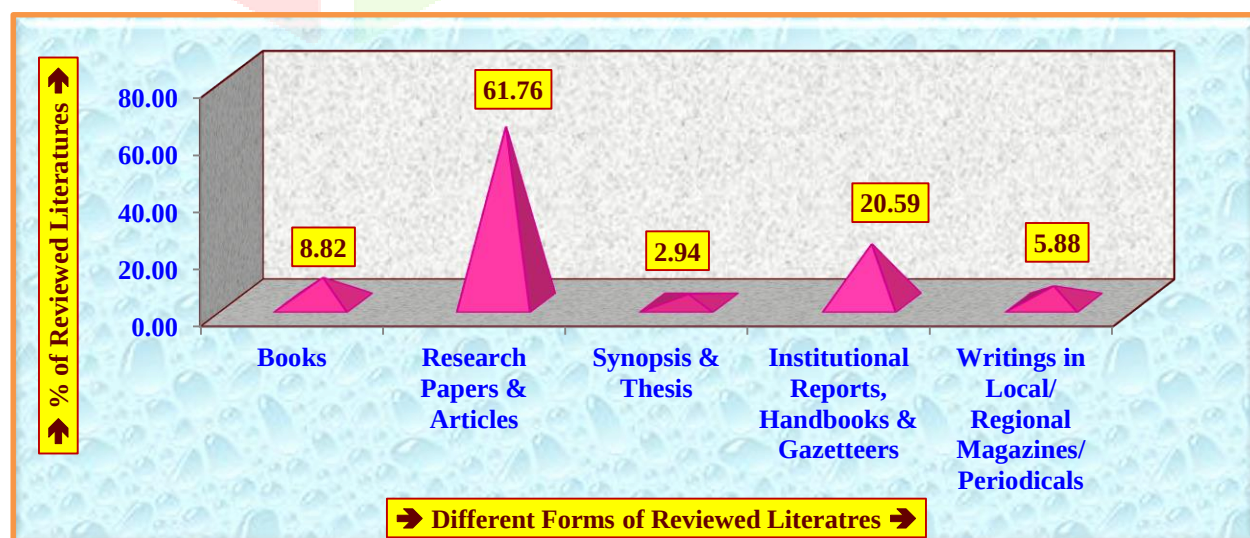


Figure 8: Statistics of Different Forms of Reviewed Literatures

10. Literature Review Summary:

Table 30: Literature Review Summary		
Thematic Area	Key Observations	References
Historical Transition	Colonial salt monopoly replaced indigenous systems; Malangis and traditional methods like khalari and pungah were marginalized.	Jana (2024); Ojha (2023); Chatterjee (2021); Sarkar (2018)
Labor and Livelihood	Salt workers face economic precarity, poor health, seasonal employment, and wage disparities.	Yadava et al. (2006); Rekha & Anandhy (2019); Banerjee Bhattacharya (2017, 2018)
Gender and Social Equity	Women's role in salt production is underappreciated; reproductive and occupational health issues prevail.	Suyambulingam et al. (2023); Sagunthala & Sadasivam (2023)
Environmental Concerns	Salt pans affect and are affected by salinity shifts, habitat degradation, and urban encroachment.	Choudhery & Rumani (2021); Sedivy (2009)
Technological Transition	Poor mechanization and branding issues in small-scale units; Gujarat leads in production due to cooperative systems.	Murugan & Muthalagu (2017); Panigrahi et al. (2024)
Policy and Governance	Welfare schemes like NMAY and CRS exist but show poor implementation; labor rights often violated.	Sahu (2012); BOBP-IGO (2006)

11. Estimated Research Gaps:

Table 31: Estimated Research Gaps		
Domain	Gaps Identified	References
Longitudinal & Seasonal Data	Few studies track long-term health, economic or migration patterns seasonally.	Yadava et al. (2006); Durairaj & Murugan (2016); Chatterjee (2021)
Gender & Caste Disaggregation	- Insufficient data on women and intersectionality. - Limited insights on caste, class, and gender-based division of labor and discrimination.	Jana (2024); Rekha & Anandhy (2019); Suyambulingam et al. (2023)
Environmental Impact	Lacks longitudinal studies on salinity spread, wetland loss, or sea-level rise.	Ojha (2023); Choudhery & Rumani (2021); Sedivy (2009)
Ecological Impact Analysis	Underexplored links between salt pan degradation, climate change, and environmental sustainability.	Ojha (2023); Choudhery & Rumani (2021); Sarkar (2018)
Technological Adoption	- No in-depth analysis of innovation uptake or mechanization feasibility. - Little analysis on modernization feasibility or techno-economic viability for small producers.	Brahma & Sudhakar (2022); Nagaraja (2015); Murugan & Muthalagu (2017)
Mental Health	Lack of biometric, nutritional, and mental health data across salt-producing zones.	Banerjee Bhattacharya (2017, 2018); Prakash & Soris (2018)
Health Metrics	Minimal biometric, nutritional, or psychological assessments of salt workers.	Banerjee Bhattacharya (2017, 2018); Prakash & Soris (2018)
Comparative Regional Studies	Focus largely on Gujarat and Tamil Nadu; West Bengal underexplored.	Panigrahi et al. (2024); Sarkar (2018)
Subaltern Voices & Oral Histories	Workers' lived experiences, especially pre-Gandhian resistance, are underrepresented.	Chatterjee (2021); Taylor (2023)

Policy Effectiveness	No measurable outcomes for schemes like NMAY, CRS, TINP, ESI, etc.	Sahu (2012); BOBP-IGO (2006); Sagunthala & Sadasivam (2023)
-----------------------------	--	---

12. Research Potentials as the Further Research

Table 32: Synthesized Thematic Avenues of Research Potentials as the Further Research Scope

Synthesized Thematic Avenues	Future Research Scope
Spatial Mapping	- GIS-based mapping of salt pan distribution and density, land use change, and infrastructure gaps. - Identify decline patterns and ecological hazard zones.
Oral Histories & Subaltern Voices	Document intergenerational stories of Malangis, Agariyas, and local salt producer communities.
Participatory Field Research	Oral history documentation of salt workers and community-led surveys.
Gender and Labour Analysis & Well-being	Studies on reproductive health, wage disparity, and decision-making power of women in salt economy.
Climate and Environmental Studies & Environmental Modelling	- Model future sustainability of salt pans under salinity shifts, sea level rise, and seasonal flooding. - Simulation of salt pan impact on coastal salinity, biodiversity, and climate resilience.
Technology & Innovation Trials	Field-testing of low-cost PPE, mechanization prototypes, and safety tools.
Techno-economic Feasibility	Pilot cost-effective mechanization and safety improvements with small and marginal salt units.
Policy Impact Assessment	- Impact analysis of welfare schemes (NMAY, CRS), labor laws, and access to social protection. - Evaluate scheme efficiency using KPIs (e.g., NMAY housing uptake, RO plants, job security indices).
Comparative Historical Studies	Mapping colonial and postcolonial trajectories of salt economies across Indian coasts.
Comparative Regional Analysis	Compare West Bengal's salt economy with Tamil Nadu, Gujarat, Odisha for best practices and policy learning.
Integrated Revival Strategy	Formulation of sustainable economic, environmental, and cultural models for reviving traditional salt-making.

13. Possible Interventions for Revitalization

To address the decline, scholars and policymakers have suggested various revival strategies. These include:

- ❖ **Government Support & Subsidies:** Providing financial incentives for traditional salt producers to modernize equipment and infrastructure (Mukherjee, 2019).
- ❖ **Technological Upgradation:** Introducing mechanized salt extraction and refining processes to improve efficiency and competitiveness (Roy & Sen, 2021).
- ❖ **Cooperative Models:** Encouraging salt workers to form cooperatives that can negotiate better prices and compete with industrial producers (Ghosh & Das, 2022).
- ❖ **Sustainable Environmental Management:** Developing eco-friendly salt farming techniques to mitigate the effects of climate change (Sarkar, 2023).

14. Conclusion:

The decline of salt manufacturing along the Midnapore coast is a multifaceted issue driven by economic, environmental, and policy factors. While challenges remain, strategic interventions such as technological modernization, cooperative business models, and government support can help revive the industry. Further research is required to explore region-specific sustainable solutions that balance economic growth with environmental conservation.

References

- Balaji, R. (2023). Salt tax and salt administration in colonial India: A study. *Nilam International Research Journal of Arts and Culture*, 4(2), 66–87.
- Banerjee, S., & Chakraborty, A. (2015). *Economic Liberalization and its Impact on Traditional Industries in West Bengal*. Kolkata: ABC Publishers.
- Bera, S. (2019). Freedom struggle in India: Midnapore, 1905–1934. *Pramana Research Journal*, 438–447.
- Bhattacharya, M. B. (2017). Evaluating overall social and health status of salt workers in experimental salt fields at Bhavnagar, Gujarat, India. *MOJ Public Health*, 97–99.
- Bhattacharya, M. B., Upadhyay, S. C., & Kurmar, A. (2018). Socio-economic and nutritional status in 'Agariyas': Salt cultivators' work as contractual manpower in organized salt industries. *International Journal of Applied and Natural Sciences (IJANS)*, 69–84.
- Brahma, R., & Sudhakar, B. D. (2022). Socioeconomic problems of marginal salt producers – A study with reference to Tamil Nadu. *Journal of Positive School Psychology*, 5029–5031.
- Chatterjee, B. (2021). The salt industry in transition: Labour, environment and indigenous participation, ca. 1757–1800. *Retail History: CHORD blog*, 1–5.
- Choudhery, A. A. B., & Rumani, S. (2006). The saga of India's salt workers. *Bay of Bengal News*, March 2006, 37–40. BOBP-IGO & Salt Commissioner's Office, Government of India.
- Choudhery, A. A. B., & Rumani, S. (2021). Assessment of hydrographic variables of salt-pans water of Mumbai, west coast of India. *Journal of Hydrogeology & Hydrologic Engineering*, 1–8.
- Choudhury, R., & Ghosh, P. (2021). Livelihood Crises in Coastal Bengal: The Case of Salt Workers in Midnapore. *Journal of Rural Studies*, 34(2), 89–104.
- Das, M. (2018). Climate Change and Coastal Livelihoods in Eastern India. *Environment & Sustainability Journal*, 45(1), 122–138.
- Durairaj, D., & Murugan, S. (2016). A study on health hazard of salt workers in Tamil Nadu coastal areas. *International Journal of Pharmaceutical Sciences Review and Research*, 137–141.
- Fine, J. (2022). Extracting empire: Changing visions of labor and environment in Bengal's salt industry. *Environmental History Now*.
- Ghosh, T., & Das, S. (2022). Cooperative Models for Rural Economic Development: Lessons from the Salt Industry. *Rural Economy Review*, 28(3), 56–73.
- Jana, M. (2024). Salt trade and trading centres of South West Bengal (18th century). *RESEARCH REVIEW: International Journal of Multidisciplinary*, 160–163.
- Karim, M. R. (2022). Salt industry in colonial Bengal. *IBS Journal*, 13, 35–54.
- Mukherjee, B. (2019). State Policies and Industrial Decline: A Study of West Bengal's Salt Industry. *Indian Economic Journal*, 67(4), 44–61.
- Murugan, S., & Muthalagu, K. (2017). A study on production and marketing problems of small scale salt pan producers in Tamil Nadu. *Paripex - Indian Journal of Research*, 6(8), 532–533.
- Nagaraja, B. (2015). Economics of salt production in India: An analysis. *Indian Journal of Applied Research*, 284–288.
- Ojha, L. C. (2023). An analysis of the salt industry in coastal region of Midnapore district in the nineteenth century: The emergence, development and gradual decay. *International Journal for Multidisciplinary Research (IJFMR)*, 1–9.

21. Panigrahi, A., Sarkar, S., & Chaudhury, S. K. (2024). An assessment of the performance evaluation of the salt industry in India with special reference to the state of Gujarat. *Journal of Management Research and Analysis*, 11(4), 229–237.
22. Prakash, S., & Soris, N. M. N. (2018). A study on the working condition of salt pan workers in Thoothukudi. *International Journal of Science, Engineering and Management (IJSEM)*, 545–548.
23. Ray, S. (2010). *History of Salt Tax and Production in Colonial Bengal*. Kolkata: Heritage Studies Press.
24. Rekha, S., & Anandhy, A. (2019). Health impact on salt workers in Kanyakumari district. *Journal of Emerging Technologies and Innovative Research (JETIR)*, 529–536.
25. Roy, D., & Sen, R. (2021). Technological Interventions in Traditional Industries: A Case Study of Salt Production. *Innovation & Sustainability Review*, 29(1), 77-95.
26. Sagunthala, M., & Sadasivam, K. (2023). Exploring the economic and health status of salt pan workers in Tuticorin district. *TIJER - International Research Journal*, 250–258.
27. Sahu, A. S. (2012). A study on salt manufacturing environment and importance of salt pans toward economic growth of the coastal areas of Purba Medinipur. *Artha Beekshan*, 118–130.
28. Sarkar, L. (2018). History of salt industry and manufacturing in Bengal during the British period. *Research Guru: Online Journal of Multidisciplinary Subjects*, 506–523.
29. Sarkar, L. (2023). Sustainable Salt Farming: Balancing Economy and Ecology. *Environmental Studies Journal*, 32(2), 102-118.
30. Sedivy, V. M. (2009). Environmental balance of salt production speaks in favour of solar saltworks. *Global NEST Journal*, 11(1), 41–48.
31. Sinha, P., Bera, M., & Bose, K. (2020). Traditional Industries and Modernization: A Comparative Study of Eastern Indian Coastal Sectors. *Development Studies*, 41(3), 150-168.
32. Suyambulingam, S., Sumathi, S., & Gayathri, R. M. (2023). Social and legal welfare of women workers at salt pan industry in Thoothukudi district, Tamil Nadu – An analytical study. *Innovations*, 99–109.
33. Taylor, M. (2023). The ungrudging Indian: The political economy of salt in India, c. 1878–1947. *South Asia: Journal of South Asian Studies*, 46(4), 791–805. <https://doi.org/10.1080/00856401.2023.2185630>
34. Yadava, Y. S., Mukherjee, R., & Mundhe, R. (2006). Socio-economic status of workers in the salt industry in India. Bay of Bengal Programme Inter-Governmental Organisation.