

MATERIAL CULTURE OF TECHNOLOGICAL TRANSFORMATION: AN INDUSTRIAL ARCHAEOLOGY REBUILDING OF SOLAPUR INDUSTRIAL LANDSCAPE

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ABSTRACT

The paper re-constructs the industrial environment of Solapur in industrial archaeological perspective to formulate the patterns of technological modernization in a local Indian textile and light-industrial hub. Using a mix of archival materials, state industrial profiles, a survey of materials described in local studies, and the study of artefacts and built fabric, the study follows the transformations between household hand-loom production and power-loom and mill production, the place of specialized products (especially the Solapuri chaddar), and the infrastructural networks that facilitated industrial change. The article maintains that material culture (surviving mill-buildings, clusters of power-loom, weaving equipment and associated industrial infrastructure) records diverse modernization marked by hybrid technology adoption, spatial restructuring of production and disproportionate social and environmental impacts. The paper ends with recommendations on the industrial heritage documentation, community involvement of the community, and policy intervention to preserve and explain the industrial history of Solapur.

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INTRODUCTION

Industrial archaeology focuses on the physical remnants of buildings of industrial activity, machinery, workshops, transport systems and objects to recreate technological, social and economic pasts (Palmer and Neaverson, 1998). The city of Solapur in south-central Maharashtra, India is both associated with a long history of weaving and textile manufacture and the development of a niche product the Solapuri chaddar (Solapur blanket). Traditionally based on handloom work, Solapur has been experiencing much technological change during the late nineteenth and twentieth centuries with the spread of mills, power-looms and modern weaving technologies. The industrial profiles of the official districts and industry estimate thousands of power looms and tens of thousands of workers related to the textile industry, which is why Solapur is a good place to study industrial archaeology (Government of Maharashtra, 2025).

The late twentieth century witnessed the decline of Solapur textile industry due to technological obsolescence, labor disputes, and global competition. Abandoned mills, rusting machinery, and derelict chimneys now dominate parts of the cityscape. These industrial ruins, often viewed as urban blight, are in fact critical archaeological resources that document phases of technological stagnation and transition. Industrial archaeology interprets these ruins not as symbols of failure but as material narratives of economic change, policy shifts, and technological displacement.

The current research seeks to trace the historical process of industrialization in Solapur by a systematic review of archival sources, governmental documents and secondary academic sources on the topic of textile production and industrialization. It aims to find, catalog and interpret the extant material evidence of this transformation, which is factory buildings, machinery, tools and remnant infrastructure that illustrate the modernization of technology in the city. The focus is specifically on how the traditional handloom weaving modulates into mechanized power-loom and mill-based production with Solapuri chaddar industry being a critical case scenario to learn about the technological change in the local textile industry.

Moreover, the paper explores socio-technical and spatial changes that were introduced by the industrialization and includes the shifts of labor organization and the patterns of settling workers and the industrial clustering that were introduced into the urban environment. It also explains the notion of technological hybridity in light of the amalgamation of the old artisanal weaving with the new industrial technologies and explains these intersections through an industrial-archaeological perspective. The environmental and infrastructural effects of the industrial activity are also estimated by using the traces of materials of production like production residues, waste location, and the transformed natural and urban landscapes. Lastly, the paper suggests a holistic paradigm of the preservation of the industrial heritage at Solapur that incorporates systematic documentation, using the industrial sites, community involvement, and sustainable policies to achieve the long term preservation of the industrial heritage at Solapur.

The reconstruction of the industrial environment in Solapur in this paper is based on synthesis of newly formed documentary materials and the material evidence to: (1) trace historical directions of industrialization in Solapur; (2) define and discuss material remains of the technological modernization; and (3) spontaneously speculate on the future application to heritage preservation and research.

METHODS AND SOURCES

Historical and quantitative context is to be found in document analysis government district gazetteers, Solapur district industry portal, DCMSME district industrial profile, GI documentation of Solapuri chaddar, and recent journalistic and local histories.

Material survey (secondary reporting) published local research, university department department reports and available PDF reports on location of factories, MIDC estates and mill histories were reviewed to identify candidate sites and types of artefact (e.g., spinning frames, dobby and jacquard attachments, rapier looms).

The material remains were subjected to typological, interpretive analysis based on the typologies of textile machinery and factory architecture prevalent in Indian settings, interpretation was done in terms of technological capacity, chronology and workplace.

Evidence of labor conditions, industrial accidents and socio-spatial arrangements (residence in factory compounds) which are pertinent to the interpretation of material remains are supplied through oral history and socio-economic context (secondary sources) local news accounts and industry profiles.

The synthesis of documentary and published material presented in this paper; fine-grained stratigraphic claims would demand the use of an in-the-field primary site survey and artifact recording.

LITERATURE REVIEW AND CONTEXTUAL BACKGROUND

The textile culture of Solapur and Solapuri chaddar:- The weaving history in Solapur dates back; local history traces the emergence of the formal weaving to the Peshawar era when the artisan societies (Peshawar Padmashali and other weaving caste) controlled household spinning of their production (RuralHandmade, 2024). A new product known as the Solapuri chaddar a cotton blanket with patterns, durability and use in the house became a regionally and nationally known product and has been registered as a Geographical Indication, which highlights its cultural and economic value.

Switch to power-loom and mill manufacturing:- The twentieth century witnessed a transition of the Solapur industry with decentralized household-led handloom industry to centralized power-loom industries and cotton mills. Documented in large numbers of registered power-loom establishments and thousands of looms and laborers evidence the process of mechanization on a large scale and expansion of factory and industrial estate systems (District Solapur; DCMSME DIPS profile). These secondary-source records serve as a baseline to archeological account of spatial agglomeration and infrastructural networks (e.g. rail links, MIDC industrial areas).

The industrial archaeology of the Indian regions: - Indian industrial archaeology is an emerging discipline, which has been concerned with colonial and post-colonial industrial locations (mills, railways, mines). Research asserts the importance of material evidence to complement archival records and oral histories, especially where records are very few. The methodology used in this case is based on traditional practices: mapping built fabric, machinery and tools typology, stratigraphic reading of factory sites, and socio-technical interpretation (Palmer and Neaverson, 1998).

HISTORICAL RECONSTRUCTION OF SOLAPUR'S INDUSTRIAL LANDSCAPE

History Early days: domestic weaving to infant industry

Historical details of handloom weaving in Solapur were a family unit using small looms, where women and children were involved in the preparatory work. This national institution continued to serve as the fundamental social technology of the textile trade at least to the twentieth century, and it influenced the early material markers clustered courtyard loom houses, dyeing pits, small storehouses to hold yarn and finished blankets (Solapur District Gazetteer 1977).

Mill age and development of factory architecture

Existing historical records point to the earliest mills being built in the late nineteenth century (such as mention of early mills in local histories, such as the Juni Mill set up in the 1870s). Larger spinning mills and weaving units were also in existence by the twentieth century and these were also in line with the greater trends of cotton textile industrialization in Maharashtra. There are typical characteristics of the Mill complexes: multi-bay brick/stone structures, high roofs to facilitate ventilation, raised plinths, and ancillary engine/turbine rooms to install steam or electric power (Oaklores, 2025).

Post-Independence industrialization: clusters of power-loom and MIDC estates

In mid-twentieth century to recent decades, the process of mechanization has gained momentum, with the spread of power-looms (both jacquard and then rapier looms) and the formation of small and medium sized industrial units in MIDC (Maharashtra Industrial Development Corporation) areas. Reports on government and development show that there are about 6,000 power-loom establishments with some 25000 looms and 30000 workers (figures in different reports and dates vary). The clusters are locally concentrated around transport points and industrial estates thus leaving archaeological remains in the form of rows of narrow single-storey weaving sheds, chimney stacks and electrical substations (S.Vernekar, 2004).

MATERIAL EVIDENCE AND SITE TYPOLOGIES

Remaining factory buildings and wrought cloth.

The buildings of the factories and mills in Solapur demonstrate typical typologies of the textile industry in India: rectangular multi-bay weaving sheds, engine/boiler houses (in which the old mills were preserved), bales storage gables, and housing of workers, usually attached or located in the factory complex. Remained buildings can be retrofitted (e.g. converted to electric power systems), patched, and indicate mechanized systems (frame anchor points, loom pits). Various early mills and subsequent MIDC estates are described in gazetteer and local history, and make the main material focal points to the issue of industrial modernization (Solapur District Gazetteer 1977).

MACHINERY, TOOLS AND MINOR ARTEFACTS.

Material remains include: Parts of the hand-loom: wooden shafts, heddles, fragments of shuttle indicators of pre-industrial technology at home.

Components of the power-loom: jacquard cards, dobby mechanisms, rapier loom headstocks; they represent mechanized patterning and increased throughput.

Spinning machinery: the remains of spinning moles, ring frames and carding machinery.

Supporting industrial tools: belt drives, pulley housings, bale hooks of raw material, and minor metal tools (wrenches, oil cans) used in the factory maintenance.

Secondary sources and accounts of industries talk of changes in the new handloom to jacquard, and then rapier looms in local industries, which could be seen in the parts of textiles and layout of the workshops.

INFRASTRUCTURE: RAILWAYS, ROADS, AND UTILITIES

Solapur's position on major north-south railway lines facilitated raw cotton inflows and distribution of finished textiles. MIDC industrial estates and local road networks provided connections essential for modernization. Material traces include goods platforms, sidings, warehouse zones, and electrical substations that supported mechanized looms. Government industrial profiles highlight Solapur's strategic location and its centrality for trade and distribution networks.

Interpretation: technology, work, and social-spatial change.

Both modernization and gradual adoption of technology.

The material remains indicate a hybridized modernization: instead of an out and out replacement of the hand technology, Solapur indicates a stratified adoption where the use of hand-loom technology, small-scale production, and larger production units coexisted. The pathway of producing Solapuri chaddar can be used as an illustration: the knowledge of traditional designs and craftsmanship was maintained, as the production increased through jacquard and rapier loom to satisfy the bigger market and the export demand. This archaeology hybridization is manifest able both in the archaeological sense of mixed assemblage (wooden shuttle fragments and jacquard hooks) and the factory compounds that combine both domestic and industrial spatial properties.

Working regimes and personal industrial life.

Archaeological evidence of worker settlements in factory grounds, small residential villages around factories and the existence of small scale shops and communal facilities indicate labor modes in which families were integrated into factory systems. The recent reports in the news about fire in factories and factory accidents highlight the precarious nature of the situation in tight industrial and residential layouts, which can be justified by the documentary and material evidence. Such socio-technical circumstances are central towards the understanding of technological modernization as a process that has a lived-in human impact (Times of India. 2025).

Spatial and environmental effects.

Mass production of weaving and other dyeing and finishing facilities leave environmental legacies - effluent, dye residue and changed land use patterns. The looming and milling began to be concentrated in certain areas and MIDC estates redefined the peri-urban landscape. Material evidence such as discoloured soil around dying pits, discarded chemical cans in run-down backyards (as reported on various local industrial accidents), and distorted stream courses to which the industrial runoff was diverted, all point to industrial activity. They are still relevant to archaeological and heritage evaluation and current remediation policy (Times of India. 2025).

HERITAGE, CONSERVATION AND POLICY SUGGESTIONS.**Record keeping and documentation.**

An organised programme is required to document the industrial sites in Solapur: the measured building plans, the photographic records of the equipment and artifacts, the oral history of local weavers, supervisors and mill workers, and the GIS maps of the power-loom cluster and old mill sites. Such documentation is institutionalized by the presence of university archaeology departments and local museums which are capable of such documentation.

Adaptive reuse and conservation through community.

It may be possible to save material fabric by selective adaptive reuse of structurally sound mill buildings as community centres, museums (textile and industrial), co-operative weaving hubs or craft incubators to support livelihoods. Intangible skill should always be supplemented by material conservation (conservation programs should use local artisan communities like weavers of Solapuri chaddar). Such efforts in cultural branding and market support can be based on GI recognition of Solapuri chaddar.

Calamity, environmental cleanup, and control.

The cases of industrial fires and chemical incidents show that there is lack of efficiency in the enforcement of safety, inspection of electrical systems, fire escapes and storage in the factories. Enhancement of environmental cleansing of dyeing and chemical waste areas should be considered a priority with heritage documentation; the regulation can be empowered by the archaeological record on the past practices of industries and current inheritance (Times of India. 2025).

CONCLUSIONS

The industrial archaeology of Solapur reveals that technological transformation is best understood through its material traces. Mills, machinery, infrastructure, and workers settlements collectively narrate the story of industrial modernity in the Deccan. By rebuilding Solapur's industrial landscape through material evidence, industrial archaeology not only enriches historical understanding but also asserts the importance of preserving industrial heritage as a vital component of India's cultural and technological legacy. The reconstruction of industrial archaeology provided shows that the modernization of Solapur technologically can be traced in factories, machines, workshops, artefacts and infrastructure. The evidence demonstrates that there is hybridization of technology, reorganization of the socio spatial, which has been built upon the power-loom clusters and MIDC estates, and material residues of both economic dynamism and socio-environmental pressures. A coordinated documentation, community involvement, policy are all required as part of preservation and additional research to connect heritage conservation and industrial and social demands of today. Notably, a next step, the primary field survey and artifact cataloguing, are urgent in order to transition to reconstruction grounded in secondary sources to a full-fledged archaeological collection of data.

Rebuilding Solapur industrial landscape involves systematic documentation, mapping, and interpretation of its surviving industrial fabric. By correlating material evidence with historical records, a layered understanding of technological transformation emerges from pre-industrial craft production to mechanized manufacturing and eventual deindustrialization.

Such reconstruction also has contemporary relevance. Recognizing Solapur industrial heritage can inform urban planning, heritage tourism, and conservation policies aligned with broader national goals of cultural preservation and sustainable development.

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